Residential Tankless Water Heater

INSTALLATION

START-UP

MAINTENANCE

PARTS

Models*
WGRTNG199
WGRTLP199

NOTICE: *Westionghouse reserves the right to make product changes or updates without notice and will not be held liable for typographical errors in literature.*

NOTE TO CONSUMER: PLEASE KEEP ALL INSTRUCTIONS FOR FUTURE REFERENCE.

The surfaces of these products contacted by consumable water contain less than 0.25% lead by weight, as required by the Safe Drinking Water Act, Section 1417.

⚠ WARNING

IF THE INFORMATION IN THIS MANUAL IS NOT FOLLOWED EXACTLY, A FIRE OR EXPLOSION MAY RESULT, CAUSING PROPERTY DAMAGE, PERSONAL INJURY, OR LOSS OF LIFE. DO NOT STORE GASOLINE OR OTHER FLAMMABLE VAPORS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER WATER HEATER.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any water heater.
- Do not touch any electrical switch.
- Do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department. Installation and service must be provided by a qualified installer, service agency, or the gas supplier.

FOR YOUR SAFETY READ BEFORE OPERATING

⚠ WARNING : If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life."

A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
WHAT TO DO IF YOU SMELL GAS
- Do not touch any electric switch; do not use any phone in your building.
- Do not try to light any appliance.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified technician. Force or attempted repair may result in a fire or explosion.
D. Do not use this appliance if any part has been under water. Immediately call a qualified technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the thermostat to lowest setting.
   (Never use Water Heater unless it is completely filled with water.)
3. Turn OFF electrical power supply to the Water Heater.
4. Don't try to light the burner by hand.
5. Turn gas shut-off valve clockwise ↷ to "OFF" position. Do not force.
6. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow step "B" above on this label. If you don't smell gas, go to the next step.
7. Turn manual gas shut-off valve countclockwise ↶ to "ON" position.
8. Turn ON electrical power to the appliance.
9. Wait until default temperature (125°F) is displayed. Set desired water temperature. Turn on hot water faucet.
10. Set thermostat to desired setting.
11. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Turn manual gas shutoff valve to "OFF".

SPECIAL ATTENTION BOXES

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important product information.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

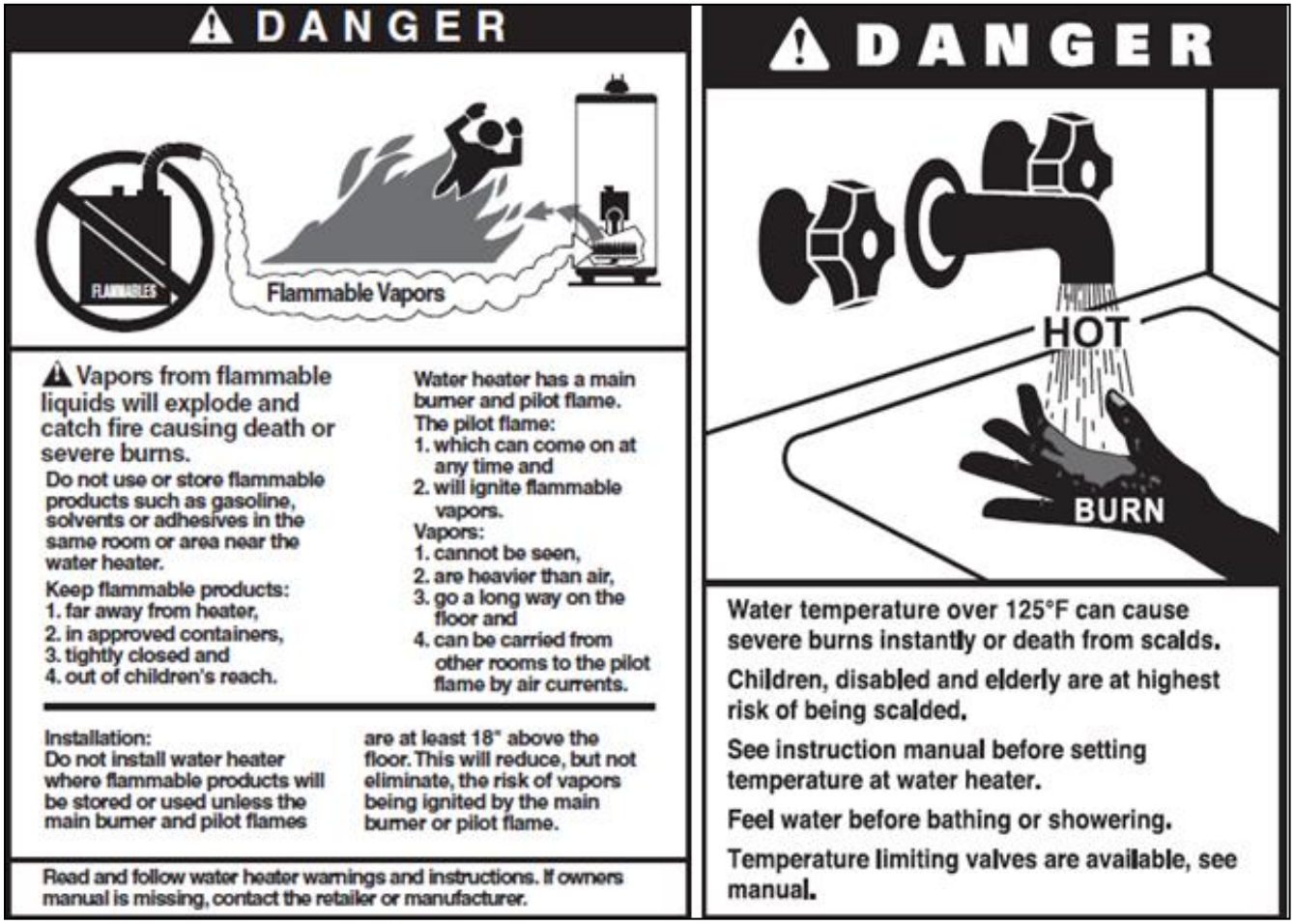
CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE	*SAFETY INSTRUCTIONS*
NOTICE is used to address practices not related to personal injury.	**SAFETY INSTRUCTIONS** (or equivalent) signs indicate specific safety related instructions or procedures.

NOTE: Contains additional information important to a procedure.


DANGER
FLAMMABLES
Flammable Vapors
Vapors from flammable liquids will explode and catch fire causing death or severe burns.
Do not use or store flammable products such as gasoline, solvents or adhesives in the same room or area near the water heater.
Keep flammable products:
1. far away from heater,
2. in approved containers,
3. tightly closed and
4. out of children's reach.
Water heater has a main burner and pilot flame.
The pilot flame:
1. which can come on at any time and
2. will ignite flammable vapors.
Vapors:
1. cannot be seen,
2. are heavier than air,
3. go a long way on the floor and
4. can be carried from other rooms to the pilot flame by air currents.
Installation:
Do not install water heater where flammable products will be stored or used unless the main burner and pilot flames are at least 18" above the floor. This will reduce, but not eliminate, the risk of vapors being ignited by the main burner or pilot flame.
Read and follow water heater warnings and instructions. If owners manual is missing, contact the retailer or manufacturer.
DANGER
HOT
BURN
Water temperature over 125°F can cause severe burns instantly or death from scalds.
Children, disabled and elderly are at highest risk of being scalded.
See instruction manual before setting temperature at water heater.
Feel water before bathing or showering.
Temperature limiting valves are available, see manual.

FOREWORD

This manual is intended to be used in conjunction with other literature provided with the water heater. This includes all related control information. It is important that this manual, all other documents included with this system, and additional publications including the National Fuel Gas Code, ANSI Z223.1-2002, be reviewed in their entirety before beginning any work.

Installation should be made in accordance with the regulations of the Authority Having Jurisdiction, local code authorities, and utility companies which pertain to this type of water heating equipment.

Authority Having Jurisdiction (AHJ) – The Authority Having Jurisdiction may be a federal, state, local government, or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department or health department, building official or electrical inspector, or *others having statutory authority*. In some circumstances, the property owner or his/her agent assumes the role, and at government installations, the commanding officer or departmental official may be the AHJ.

NOTE: Westinghouse reserves the right to modify product technical specifications and components without prior notice.

FOR THE INSTALLER

⚠ DANGER

This manual must only be used by a qualified heating installer/service technician. Read all instructions in this manual before installing. Perform steps in the order given. Failure to comply could result in substantial property damage, severe personal injury, or death.

This appliance must be installed by qualified and licensed personnel. The installer should be guided by the instructions furnished with the water heater, and with local codes and utility company requirements. In the absence of local codes, preference should be given to the National Fuel Gas Code, ANSI Z223.1-2002.

INSTALLATIONS MUST COMPLY WITH:
Local, state, provincial, and national codes, laws, regulations and ordinances.

The latest version of the National Fuel Gas Code, ANSI Z223.1, from American Gas Association Laboratories, 8501 East Pleasant Valley Road, Cleveland, OH 44131.

In Canada – CGA No. B149 (latest version), from Canadian Gas Association Laboratories, 55 Scarsdale Road, Don Mills, Ontario, Canada M3B 2R3. Also, Canadian Electrical Code C 22.1, from Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.

Code for the installation of Heat Producing Appliances (latest version), from American Insurance Association, 85 John Street, New York, NY 11038.

The latest version of the National Electrical Code, NFPA No. 70.

NOTE: The gas manifold and controls met safe lighting and other performance criteria when the water heater underwent tests specified in ANSI Z21.10.3 – latest edition.

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PART 1 – ITEMS SHIPPED WITH THE WATER HEATER

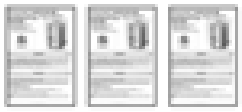
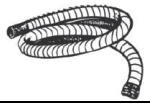
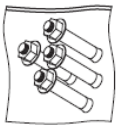
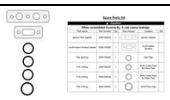
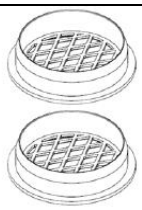
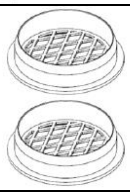
ITEM	DESCRIPTION	QUANTITY
Residential Tankless Water Heater WGRTNG199 WGRTLP199		1
Quick Reference Guide, User, and Installation Manuals		1 Each
Condensate Hose		1
Anchors and Wall Mounting Bracket		4
Spare Parts Kit (Gaskets and O-Rings)		1
Vent Screens (3”)		2 Screens
OPTIONAL PARTS (Not Included)		
150 PSI Pressure Relief Valve		1
Tankless Isolation Valves		2
Vent Screens (2” Mesh)		2 Screens

Table 1 – Items Included with the Water Heater

PART 2 – SAFETY REGULATIONS

A. OPERATION AND INSTALLATION WARNINGS

To avoid serious injury or death, read, understand, and follow all the precautions listed here.

⚠ DANGER

Vapors from flammable liquids will explode and can cause a fire, resulting in personal injury or death. The water heater has a burner that can come on at any time and ignite vapors. DO NOT use or store flammable liquids around the water heater.

Improper venting can cause a build-up of carbon monoxide. Breathing carbon monoxide can result in brain damage or death. DO NOT operate the water heater unless it is properly vented to the outside and has an adequate fresh air supply for safe operation. Inspect the exterior exhaust gas outlet port and fresh air inlet port on a regular basis to ensure they are functioning properly.

A concentration of carbon monoxide as small as .04% (400 parts per million) in the air can be fatal. When making high fire or low fire adjustments, CO levels must be monitored using a flue gas analyzer such that a CO level of no more than 150 ppm is exceeded at any time during operation.

Adjusting the “low fire offset” or the “main flow restrictor” in small increments can result in a significant increase in CO concentration. To avoid serious injury or death, DO NOT make any adjustments to the gas valve without monitoring the exhaust gases with a fully functional and calibrated flue gas analyzer.

⚠ WARNING

This water heater must be installed by a licensed plumber, licensed gas fitter, and/or professional service technician. Improper installation and/or operation can cause a potentially hazardous situation, which, if not avoided, could result in serious injury or death, and will void the warranty.

Westinghouse cannot anticipate every circumstance that might involve a potential hazard. Each installation has its own specialized characteristics, requirements, and possible hazards. Therefore, all possible incidents are not included in these warnings. Proper and safe installation, operation, and service are the responsibility of the professional service technician.

Proper care of the water heater is the user’s responsibility. Ensure the user carefully reads and understands the User’s Information Manual before operating and maintaining the water heater.

Make sure the user knows the location of the gas shut-off valve and how to operate it. Immediately close the gas shut-off valve if the water heater is subjected to fire, overheating, flood, physical damage, or any other damaging condition that might affect the operation of the unit. Have the water heater checked by a qualified technician before resuming operation.

Do not power up the unit unless the gas and water supply valves are fully opened. Make sure the fresh air intake port and exhaust gas port are open and functional.

No one but a professional service technician should attempt to install, service, or repair this water heater. There are no serviceable parts which can be changed by the user / owner. User / Owner: Contact the original professional service technician if the water heater needs repair or maintenance. If the original technician is unavailable, ask your gas supplier for a list of qualified service providers.

Keep the area around the water heater clean and free of all materials that can burn. DO NOT store or place gasoline, oils, spray paint, or other flammable products near the water heater.

DO NOT use spray paint, hair spray, or any other flammable spray near the water heater or near the exterior fresh air intake port. DO NOT place any items in or around the exterior exhaust gas outlet port and/or fresh air inlet port that could restrict or block the flow in or out of the vent system.

DO NOT store or place newspapers, laundry, or other combustible items near the water heater or the exterior exhaust gas outlet and/or fresh air inlet port.

The owner should inspect the system monthly for damage, water stains, signs of rust, corrosion, and exhaust vent and air intake blockage. If inspection of the unit shows signs of damage, the water heater should be shut off until the problem is repaired by a qualified technician.

After installation, all water heater safety devices should be tested.

This water heater is certified for indoor installations only. The water heater consists of gas ignition system components which must be protected from water (dripping, spraying, etc.) during operation and service. Carefully consider installation location and the placement of critical components (circulators, condensate neutralizers, etc.) before installing the water heater.

DO NOT allow children to operate this unit. DO NOT use this unit if it does not appear to be operating correctly. A qualified technician should service and inspect the water heater annually.

The water heater temperature is factory set to 125^{o}F (51.7^{o}C). To avoid scalding, always check the temperature of the hot water before bathing, showering, washing, etc. DO NOT adjust the water temperature while the water heater is being used by other persons.

NOTICE

If the water heater is exposed to the following, do not operate until all corrective steps have been made by a qualified service technician:

1. FIRE
2. DAMAGE
3. WATER

DO NOT alter or modify the water heater or water heater controls. This can be dangerous and WILL VOID the warranty.

This water heater is equipped with a three prong plug. It should only be plugged directly into a properly grounded three prong receptacle. DO NOT remove the ground plug from the plug.

Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

This water heater provides a overheat shutdown limit. In the event the water heater water exceeds the set point of the control limit, the cutoff will trip and the water heater will shut down. Certain local codes require additional temperature limits. In addition, certain types of systems may operate at temperatures below the minimum set point of the limit provided with the water heater. Contact Westinghouse for additional overheat controls.

NOTE: When inquiring about service or troubleshooting, reference the model and serial numbers from the water heater rating label.

⚠ WARNING

DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN SUBMERGED IN WATER. Immediately call a qualified service technician. The appliance MUST BE replaced if it has been submerged. Attempting to operate an appliance that has been submerged could create numerous harmful conditions, such as a potential gas leakage causing a fire and/or explosion, or the release of mold, bacteria, or other harmful particulates into the air. Operating a previously submerged appliance could result in property damage, severe personal injury, or death.

NOTE: Appliance damage due to flood or submersion is considered an Act of God, and IS NOT covered under product warranty.

⚠ WARNING

Be sure to disconnect electrical power before opening water heater cabinet or performing service. Label all wires while performing service to ensure proper re-wiring of the water heater. Wiring errors can cause improper or dangerous operation. Failure to do so could result in an electrical shock, improper water heater operation, property damage, serious personal injury, or death.

C. IMPROPER COMBUSTION

⚠ WARNING

Do not obstruct the flow of combustion and ventilating air. Adequate air must be provided for safe operation. Failure to keep the exhaust vent and intake pipe clear of ice, snow, or other debris could result in property damage, serious personal injury, or death.

D. GAS

Should overheating or gas supply fail to shut off, do not turn off or disconnect electrical supply to the circulator. Instead, shut off the gas supply at a location external to the appliance.

E. WHEN SERVICING THE WATER HEATER

- To avoid electric shock, disconnect electrical supply before performing maintenance.
- To avoid severe burns, allow water heater to cool.
- Do not use petroleum-based cleaning or sealing compounds in a water heater system. Gaskets and seals in the system may be damaged, possibly resulting in substantial property damage.
- Do not use “homemade cures” or “patent medicines”. Substantial property damage, damage to water heater, and/or serious personal injury may result.
- Always verify proper operation after servicing the water heater.

F. WATER QUALITY

Potable water is defined as drinkable water supplied from utility or well water in compliance with EPA secondary maximum contaminant levels (40 CFR Part 143.3) as shown in Table 2. If your water contains contaminants higher than outlined by EPA, then water treatment is recommended and additional maintenance may be required. If you suspect that your water is contaminated in any way, discontinue use of the water heater and contact an authorized technician or licensed professional.

Contaminant	Maximum Allowable Level
Total Hardness	200 mg/l (12 grains/gallon)
Aluminum	0.05 to 0.2 mg/l
Chloride	250 mg/l
Copper	1 mg/l
Iron	0.3 mg/l
Manganese	0.05 mg/l
pH	6.5-8.5
Sulfate	205 mg/l
Total Dissolved Solids (TDS)	500 mg/l
Zinc	205 mg/l

Table 2 – Water Quality Specifications

G. FREEZE PROTECTION

CAUTION

Consider water heater piping and installation when determining water heater location.

NOTE: Damages resulting from incorrect installation or from use of products not approved by Westinghouse ARE NOT covered by warranty.

PART 3 – TECHNICAL SPECIFICATIONS

MODEL		WGRTNG199 / WGRTLP199
Installation		Indoor, Wall Hung, Fully Condensing
Minimum / Maximum Input (Btu/Hr)		19,900 / 199,000
Hot Water Capacity	**35°F Rise**	11 Gal
	45°F Rise	8.5 Gal
	77°F Rise	5 Gal
Flue System		Sealed Combustion Direct Vent
Vent Run		2" (15 feet), 3" (100 feet), Schedule 40 PVC, CPVC, PP
Weight (lbs)		88
Orifice Size	**NG**	.374" (9.5 mm)
	LP	Consult Factory
Gas Supply Pressure	**NG**	3.5" to 14" WC
	LP	3.5" to 14" WC
Manifold Pressure	**Min (3")**	NG: -0.01" / LP: -0.11" WC
	Max (3")	NG: -0.05" / LP: -0.06" WC
Power Supply	**Main Supply**	120V 60 Hz
	Maximum Power Consumption	135W
General Operating Conditions		**Temperature** • Ambient Temperature Range: 33 – 104°F (0.6 – 40°C) • Operating Relative Humidity: Up to 90% at 140°F (40°C) • Shipping and Storage Temperature Range: -4 – 176°F (-20 – 80°C) **Input Ratings** • Power Supply and Communication (CN4): 14V DC **Product Approvals and Requirements** • EMC: 89/336/EEC • LVD: 73/23/EEC)
Ignition System		Direct Electronic Ignition / Automatic Flame Sensing
Burner System		Single Orifice Premixed Fuel Modulation Metal Fiber Infrared
Gas Valve System		Air Ratio Valve
Minimum Flow Rate		0.5 GPM
Internal Pipe Material		Stainless Steel
Dimensions		W 17.3" – H 27.6" – D 14.8"
Sub Heat Exchanger Water Capacity (DHW)		Under 2 Gallons
Main Controller / Control Panel		P-920C / GTH-9500C
Water Pressure		Min 15 – Max 150 PSI
Connection Sizes	**Cold Water Inlet / Hot Water Outlet**	¾" NPT
	Gas Inlet	¾" NPT
Materials	**Cabinet**	Cold Rolled Carbon Steel
	Heat Exchanger	Primary Heat Exchanger: Stainless Steel Secondary Heat Exchanger: Stainless Steel
Safety Devices		Flame Rod, Burner Overheat Cut Off Device 302°F (150°C), Gas Leak Detector, Flue High Limit Switch 149°F (65°C), Water Temperature High Limit Switch 199°F (93°C), Freeze Protection Ceramic Heater (Turns on at 41°F / 5°C, Turns off at 59°F / 15°C)

Table 3 – Technical Specifications

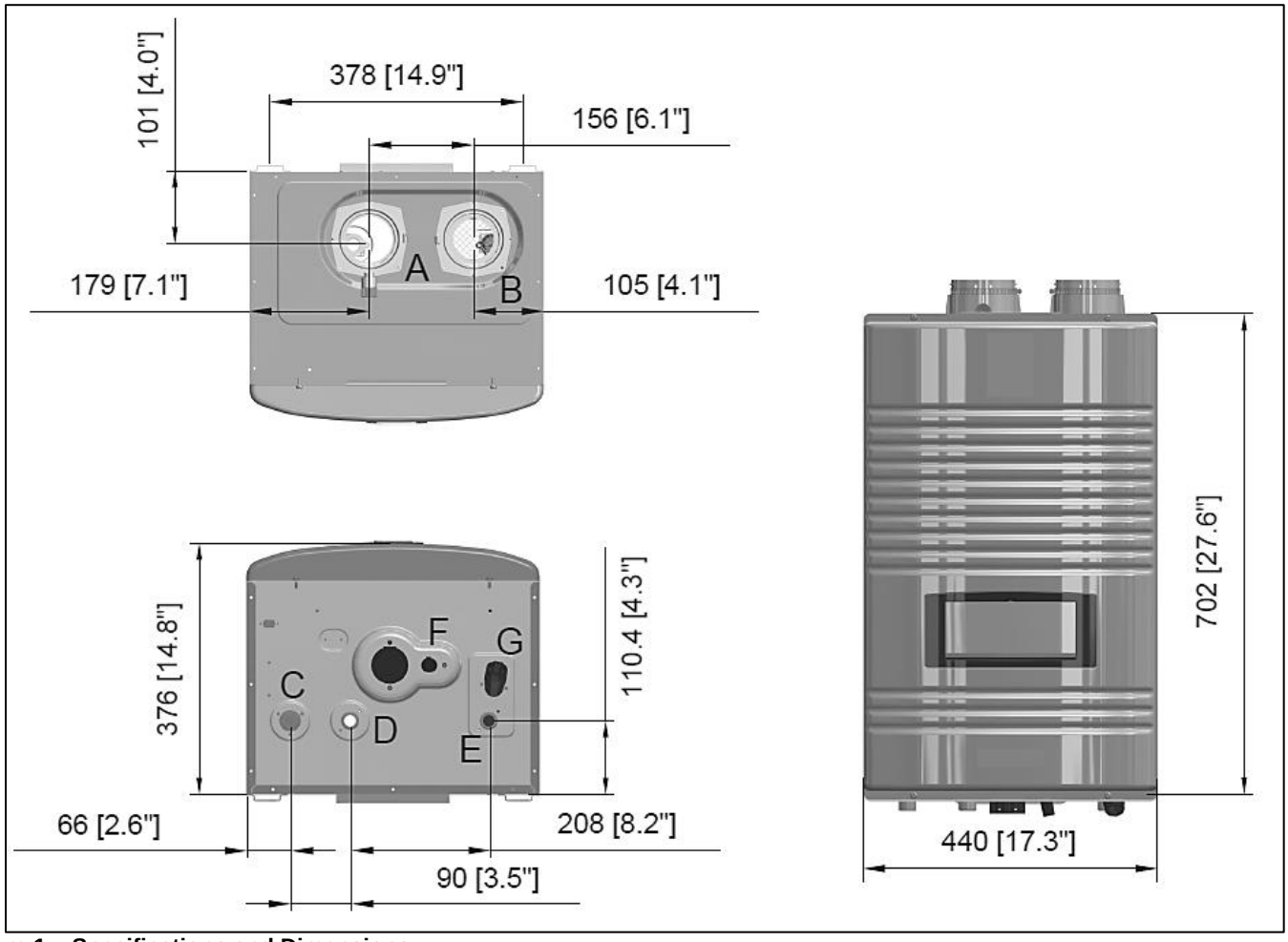


Figure 1 – Specifications and Dimensions

	DESCRIPTION	DIAMETER
A	Exhaust Outlet Pipe	3”
B	Air Intake	3”
C	Gas Inlet	¾”
D	DHW Outlet Adapter	¾”
E	DHW Inlet Adapter	¾”
F	Condensate Adapter	½”
G	DHW Inlet Filter	N/A

Table 4 – Adapter Specifications

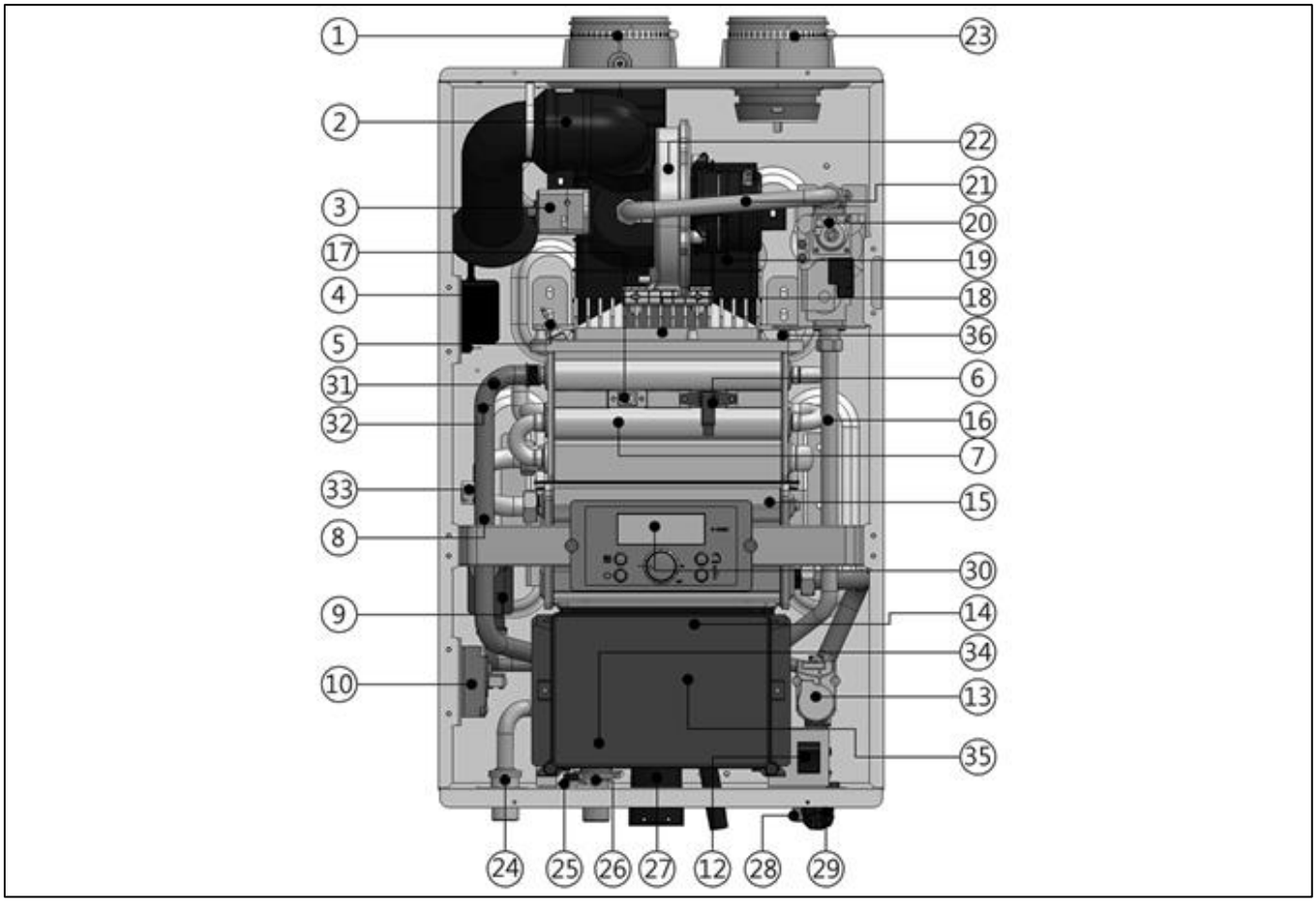


Figure 2 – Components

NUMBER	COMPONENT DESCRIPTION	NUMBER	COMPONENT DESCRIPTION
1	Exhaust Vent Adapter	**19**	Exhaust Duct
2	Air Inlet Pipe	**20**	Gas Valve
3	AGM (Air Gas Mixer)	**21**	Gas Inlet Pipe 2
4	Ignition Transformer	**22**	BLDC Fan
5	Igniter	**23**	Air Intake Pipe Adapter
6	Flame Detection Sensor	**24**	Gas Inlet Adapter
7	Primary Heat Exchanger Assembly	**25**	Freeze Protector
8	Hot Water Outlet	**26**	DHW Outlet Adapter
9	Mixing Valve	**27**	Condensate Trap
10	Air Pressure Switch	**28**	Cold Water Inlet Adapter
11	N/A	**29**	Cold Water Inlet Filter
12	Manual Power Switch	**30**	Control Panel
13	Water Adjustment Valve	**31**	Operating Temperature Sensor
14	Main Controller	**32**	High Limit Overheat Switch
15	Secondary Heat Exchanger Assembly	**33**	Ceramic Heater
16	Gas Inlet Pipe 1	**34**	DHW Sensor
17	Flame Sight Glass	**35**	Condensate Trap Hose
18	Burner Case	**36**	Burner Overheat Switch

Table 5 – Component List

PART 4 – PREPARE WATER HEATER LOCATION

CAUTION
Carefully consider installation when determining water heater location. Please read the entire manual before attempting installation. Failure to properly take factors such as water heater venting, piping, condensate removal, and wiring into account before installation could result in wasted time, money, and possible property damage and personal injury.

A. BEFORE LOCATING THE WATER HEATER

⚠ WARNING

Incorrect ambient conditions can lead to damage to the heating system and put safe operation at risk. Ensure that the water heater installation location adheres to the information included in this manual. Failure to do so could result in property damage, serious personal injury, or death.

CAUTION

Failure of water heater or components due to incorrect operating conditions IS NOT covered by product warranty.

1. Installation Area (Mechanical Room) Operating Conditions
   - Ensure ambient temperatures are higher than 32°F/0°C and lower than 104°F/40°C.
   - Prevent the air from becoming contaminated by the products, places, and conditions listed in this manual.
   - Avoid continuously high levels of humidity
   - Never close existing ventilation openings

CAUTION

The service life of the water heater's exposed metallic surfaces, such as the cabinet, as well as internal surfaces, such as the heat exchanger, are directly influenced by proximity to damp and salty marine environments. In such areas, higher concentration levels of chlorides from sea spray coupled with relative humidity can lead to degradation of the heat exchanger and other water heater components. In these environments, water heaters must not be installed using direct vent systems which draw outdoor air for combustion. Such water heaters must be installed using room air for combustion. Indoor air will have a much lower relative humidity and, hence, potential corrosion will be minimized.

⚠ WARNING

This water heater is certified for indoor installations only. Do not install the water heater outdoors. Failure to install this water heater indoors could result in substantial property damage, severe personal injury, or death.

2. Check for nearby connections to:
   - System water piping
   - Venting connections
   - Gas supply piping
   - Electrical power
   - Condensate drain

CAUTION

Locate the water heater where any leakage from the relief valve, related piping, tank, or connections will not result in damage to surrounding areas or lower floors of the building. The water heater should be located near a floor drain, or installed in proximity to an adequately drained drain pan. Westinghouse WILL NOT be held liable for leakage damages.

To conserve water and energy, insulate all water piping, especially the hot and recirculation water lines.

3. Check area around water heater. Remove any combustible materials, gasoline, and other flammable liquids.

⚠ WARNING

Failure to keep water heater area clear and free of combustible materials, liquids, and vapors can result in substantial property damage, severe personal injury, or death.

4. Gas control system components must be protected from dripping water during operation and service.

5. If the water heater is to replace an existing water heater, check for and correct any existing system problems, such as:
   - System leaks
   - Location that could cause the system and water heater to freeze and leak.
   - Incorrectly-sized expansion tank

CAUTION

Do not connect the water heater to any heating systems or components that have been previously used for non-potable applications.

Do not introduce toxic chemicals, such as antifreeze or water heater treatments, into the water heater or any piping meant for potable water purposes.

Ensure that all piping and components connected to the water heater are suitable for potable water applications.

CAUTION
Do not use this water heater for space heating applications.
Circulators suitable for DHW applications must be used.

6. Clean and flush system when reinstalling a water heater.

NOTE: When installing in a zero clearance location, it may not be possible to read or view some product labeling. It is recommended to make note of the water heater model and serial number.

B. LEVELING

CAUTION
In order for the condensate to properly flow out of the collection system, the water heater must be installed level.

C. CLEARANCES FOR SERVICE ACCESS

See Table 6 for recommended service clearances. If these minimum clearances are not provided, it may not be possible to service the water heater without removing it from the space.

⚠ WARNING
Space must be provided with combustion/ventilation air openings correctly sized for all other appliances located in the same space as the water heater. The water heater cover must be securely fastened to prevent it from drawing air from the water heater room. This is particularly important if the water heater is in a room with other appliances. Failure to comply with the above could result in substantial property damage, severe personal injury, or death.

MINIMUM CLEARANCES		
Installation Clearances from Non-Combustibles / Combustibles		Recommended Service and Proper Operation Clearances
Top	9 in. (228.6 mm)	9 in. (228.6 mm)
Back	5/8 in. (15.9 mm)	5/8 in. (15.9 mm)
Front	6 in. (152.4 mm)	24 in. (609.6 mm) or more (Front of Water heater) (A combustible door or removable panel is acceptable front clearance.)
Right Side	3 in. (76.2 mm)	3 in. (76.2 mm)
Left Side		
Bottom	12 in. (304.8 mm)	12 in. (304.8 mm)

Table 6 – Minimum Installation and Service Clearances

NOTE: The exhaust vent piping for this direct vented appliance is approved for zero clearance to combustible construction.

NOTE: If the water heater is installed in a narrow space or corner, ensure that there is sufficient space for service and maintenance access. There should be easy access to the gas and water lines and internal components for future service. A combustible door or removable panel is acceptable front clearance.

D. RESIDENTIAL GARAGE INSTALLATION

If the water heater is located in a residential garage, per ANSI Z223.1:

- Mount the bottom of the water heater a minimum of 18” above the floor of the garage, to ensure the burner and ignition devices are well off the floor.
- Locate or protect the water heater so it cannot be damaged by a moving vehicle.

E. EXHAUST VENT AND INTAKE PIPE

⚠ WARNING
Vents must be properly supported. The water heater exhaust and intake connections are not designed to carry heavy weight. Vent support brackets must be within 1’ of the water heater and the balance at 4’ intervals. Venting must be readily accessible for visual inspection for the first 3’ from the water heater.

You must also install air intake piping from outdoors to the water heater flue adaptor. The resultant installation is categorized as direct vent (sealed combustion).

NOTE: To prevent combustion air contamination, see Table 7 in this section when considering exhaust vent and intake pipe termination.

Exhaust vent and intake pipe may be vented vertically through the roof or out a side wall. Venting methods are detailed in the Venting Section. Do not attempt installation using any other means. Be sure to locate the water heater so exhaust vent and intake piping can be routed through the building and properly terminated. Exhaust vent and intake piping lengths, routing, and termination method must comply with methods and limits given in the venting section.

F. PREVENT COMBUSTION AIR CONTAMINATION

Install intake piping for the water heater as described in the Venting section. Do not terminate exhaust in locations that can allow contamination of intake air.

⚠ WARNING

Ensure that the intake air will not contain any of the contaminants below. For example, do not pipe intake near a swimming pool. Avoid areas subject to exhaust fumes from laundry facilities. These areas always contain contaminants. Contaminated air will damage the water heater, resulting in possible substantial property damage, severe personal injury, or death.

PRODUCTS TO AVOID	AREAS LIKELY TO HAVE CONTAMINANTS
Spray cans containing fluorocarbons	Dry cleaning/laundry areas and establishments
Permanent wave solutions	Swimming pools
Chlorinated waxes/cleaners	Metal fabrication plants
Chlorine-based swimming pool chemicals	Beauty shops
Calcium chloride used for thawing	Refrigeration repair shops
Sodium chloride used for water softening	Photo processing plants
Refrigerant leaks	Auto body shops
Paint or varnish removers	Plastic manufacturing plants
Hydrochloric or Muriatic acid	Furniture refinishing areas and establishments
Cements and glues	New building construction
Antistatic fabric softeners used in clothes dryers	Remodeling areas
Chlorine-type bleaches, laundry detergents, and cleaning solvents	Garages and workshops
Adhesives used to fasten building products	

Table 7

NOTE: DAMAGE TO THE WATER HEATER CAUSED BY EXPOSURE TO CORROSIVE VAPORS IS NOT COVERED BY WARRANTY. (Refer to the limited warranty for complete terms and conditions).

G. REMOVING A WATER HEATER FROM A COMMON VENT SYSTEM

⚠ DANGER

Do not install the water heater into a common vent with any other appliance. This will cause flue gas spillage or appliance malfunction, resulting in possible substantial property damage, severe personal injury, or death.

⚠ DANGER

Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

When removing an existing water heater, the following steps must be followed.

1. Seal any unused openings in the common venting system.

2. Visually inspect the venting system for proper size and horizontal pitch to determine if there is blockage, leakage, corrosion or other deficiencies that could cause an unsafe condition.

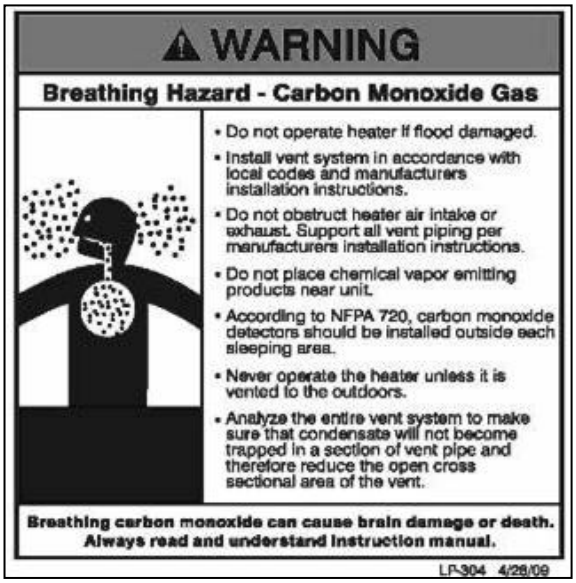

⚠ WARNING
Breathing Hazard - Carbon Monoxide Gas
• Do not operate heater if flood damaged.
• Install vent system in accordance with local codes and manufacturers installation instructions.
• Do not obstruct heater air intake or exhaust. Support all vent piping per manufacturers installation instructions.
• Do not place chemical vapor emitting products near unit.
• According to NFPA 720, carbon monoxide detectors should be installed outside each sleeping area.
• Never operate the heater unless it is vented to the outdoors.
• Analyze the entire vent system to make sure that condensate will not become trapped in a section of vent pipe and therefore reduce the open cross sectional area of the vent.
Breathing carbon monoxide can cause brain damage or death.
Always read and understand instruction manual.
LP-304 4/26/09

Figure 3 - CO Warning Label

3. If practical, close all building doors, windows and all doors between the common venting system and other spaces in the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, at maximum speed. Do not operate a summer exhaust fan. Close all fireplace dampers.

4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust the thermostat so the appliance will operate continuously.

5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle or smoke from a cigarette.

6. After it has been determined that each appliance remaining connected to common venting system properly vents when tested as outlined, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous condition of use.

7. Any improper operation of the common venting system should be corrected so the installation conforms to the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z 223.1.

H. UNCRATING THE WATER HEATER

⚠ WARNING

UNCRATING WATER HEATER – Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

CAUTION

Cold weather handling – If water heater has been stored in a very cold location (below 0°F) before installation, handle with care until the plastic components come to room temperature.

Remove all sides of the shipping crate to allow the water heater to be lifted into its installation location.

I. WALL-MOUNTING THE WATER HEATER

⚠ WARNING

The water heater must be installed on a wall that can bear its weight (more than 88 lbs. when fully plumbed and full of water). Installing the water heater on a wall which cannot support its weight could result in property damage, personal injury, or death.

The water heater may be installed on any suitable internal wall (suitable sound-proofing may be required when installing onto a stud partition wall).

⚠ WARNING

This water heater is too heavy for one person to lift. It is highly recommended to install the water heater with two people. Use caution as to not drop the water heater, which could damage the water heater and cause property damage and/or severe personal injury. Verify that the water heater is properly and securely mounted before leaving unsupervised. Failure to comply with the above and properly mount the water heater could result in substantial property damage, severe personal injury, or death.

⚠ WARNING

This wall mounting system is not seismic rated and should not be applied as such. Failure to comply with the above and properly mount the water heater could result in substantial property damage, severe personal injury, or death.

POSITIONING THE WATER HEATER ON THE WALL

1. Attach the wall bracket on the location where you want to install the water heater. Ensure it is level and on stud (16” centers) before proceeding.
2. Mark the four drill holes with a pencil or marker. Remove the wall bracket.
3. Drill four (4) holes using a 5/32 drill bit at the marked hole locations.
4. Mount the wall bracket to the wall with the four (4) included anchor bolts. Ensure the mounted bracket is level. See Figure 4A.
5. Align the heater bracket grooves on the back of the water heater with the tongues on the wall bracket and hang the water heater on the bracket. See Figure 4B.

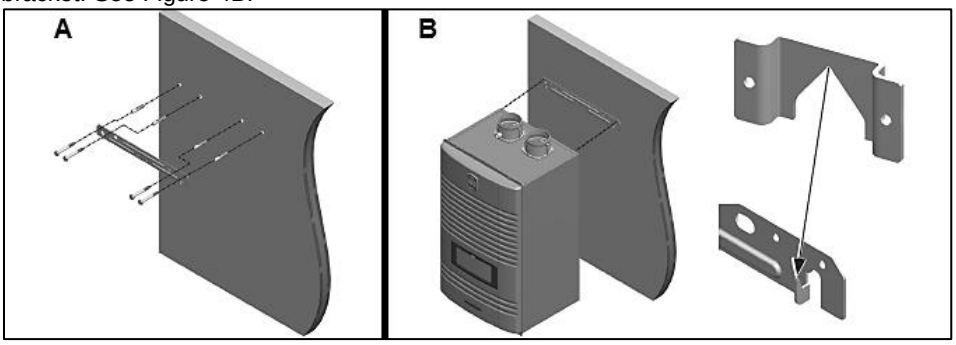


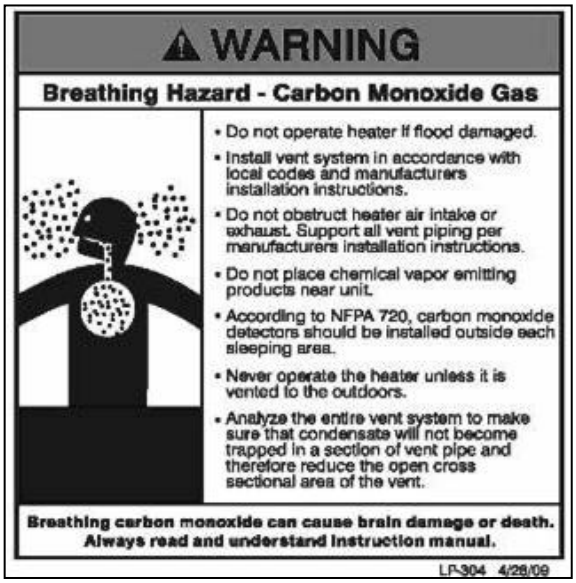
Figure 4 – Wall Mounting the Water Heater

PART 5 – VENTING

⚠ DANGER
Vent this water heater in accordance with these instructions. Failure to do so will result in property damage, severe personal injury, or death.

⚠ WARNING
DO NOT mix vent systems or materials unless specifically told to do so in this manual.
DO NOT thermally insulate the exhaust vent or intake pipes.
DO NOT use an electric damper, vent damper, or draft hood with this water heater.
DO NOT locate the exhaust vent or intake pipe terminations where exposed to prevailing winds.
Moisture will be produced by the exhaust vent. Take precautions when determining exhaust vent termination. Moisture may fall from the vent termination to the ground and turn to ice in freezing conditions. Moisture or ice can produce a hazardous condition.
Exhaust condensate is acidic, and could deteriorate the surface below the exhaust vent termination. Ensure this surface is in good repair (sealed, painted, etc.) to prevent deterioration.
Failure to follow these instructions could result in property damage, severe personal injury, or death.

A. INTAKE PIPE AND EXHAUST VENT GUIDELINES


WARNING
Breathing Hazard - Carbon Monoxide Gas
• Do not operate heater if flood damaged.
• Install vent system in accordance with local codes and manufacturers installation instructions.
• Do not obstruct heater air intake or exhaust. Support all vent piping per manufacturers installation instructions.
• Do not place chemical vapor emitting products near unit.
• According to NFPA 720, carbon monoxide detectors should be installed outside each sleeping area.
• Never operate the heater unless it is vented to the outdoors.
• Analyze the entire vent system to make sure that condensate will not become trapped in a section of vent pipe and therefore reduce the open cross sectional area of the vent.
Breathing carbon monoxide can cause brain damage or death.
Always read and understand instruction manual.
LP-304 4/28/09

1. Vent system must be installed in accordance with local codes, or, in absence of local codes, the National Fuel Gas Code, ANSI Z223.1 / NFPA 54 and/or CSA B149.1, Natural Gas and Propane Installation Code.

2. **For installation in Canada**, installer supplied plastic vent piping must comply with CAN/CGA B149.1 and be certified to the Standard for Type BH Gas Venting Systems, ULC-S636. Components of this listed system must not be interchanged with other vent systems or unlisted pipes or fittings. All plastic components and specified primers and glues must be from a single system manufacturer and must not be intermixed with another system manufacturer's products. Clean and dry all applicable surfaces before applying cement.

3. This water heater is designed to be installed as a direct vent (sealed combustion) type. Combustion air must be supplied directly from the outdoors to the burner, and the flue (exhaust) gases should be vented directly to the outdoors through the wall or roof.

4. This water heater uses 2" or 3" diameter pipe for exhaust vent and intake pipe. It is important to ensure an airtight seal from the water heater collar to the vent terminations. It is EXTREMELY IMPORTANT that the maximum allowed combined venting lengths are not exceeded. See Table 9 for a list of Approved Vent Materials and Table 10 for Approved Vent Lengths.

5. Do not install venting system components on the exterior of the building except as specifically required by these instructions.
- Vent terminals must be at least 1 foot from any door, window, or gravity inlet into the building.
- Maintain the correct clearance and orientation between the exhaust vent and intake pipe terminals.
- The exhaust vent and air intake terminals must be at the same height and their center lines must be spaced apart 1 foot minimum.
- The bottom of the exhaust vent and intake pipe terminals must be at least 1 foot above the normal snow accumulation level. In no case should these terminals be installed less than 1 foot above normal snow accumulation level.
- Do not install the exhaust vent terminals directly above windows or doors.
- Intake pipe terminal must not terminate in areas that might contain combustion air contaminates, such as near swimming pools.
- For sidewall venting, the minimum horizontal distance between adjacent exhaust vent terminations is 1 foot. It is recommended this distance be greater than 1 foot to better avoid frost damage to building surfaces.
- For roof venting, minimum horizontal distance between any adjacent exhaust vent termination is 1 foot.

⚠ WARNING
All joints of positive pressure vent systems must be sealed completely to prevent leakage of flue products into living space.

- Remove all burrs and debris from joints and fittings.
- When using PVC or CPVC pipe, all joints must be properly cleaned, primed, and cemented. Use only cement and primer approved for use with the pipe material. Cement must conform to ASTM D2564 for PVC and ASTM F493 for CPVC pipe. **NOTE: DO NOT CEMENT POLYPROPYLENE PIPE.**

- Ensure the vent is located where it will not be exposed to prevailing winds.
- In all roof venting applications, exhaust discharge must point away from the pitch of the roof.
- To prevent water leakage, install adequate roof flashing where the pipe enters the roof.
- Do not locate vent over public walkways, driveways, or parking lots. Condensate could drip and freeze, resulting in a slip hazard or damage to vehicles and machinery.
- Due to potential moisture build-up, sidewall venting may not be the preferred venting option. To save time and cost, carefully consider venting installation and location.
- Horizontal lengths of exhaust vent must slope back towards the water heater not less than ¼" per foot to allow condensate to drain from the vent pipe.
- The exhaust vent must terminate where vapors cannot make accidental contact with people or pets, or damage shrubs or plants.
- In vacant chimney applications, install and seal a rain cap over existing chimney openings.
- All piping must be fully supported. Use pipe hangers at a minimum of 4 foot intervals to prevent sagging of the pipe where condensate may form.
- Do not use the water heater to support any piping.

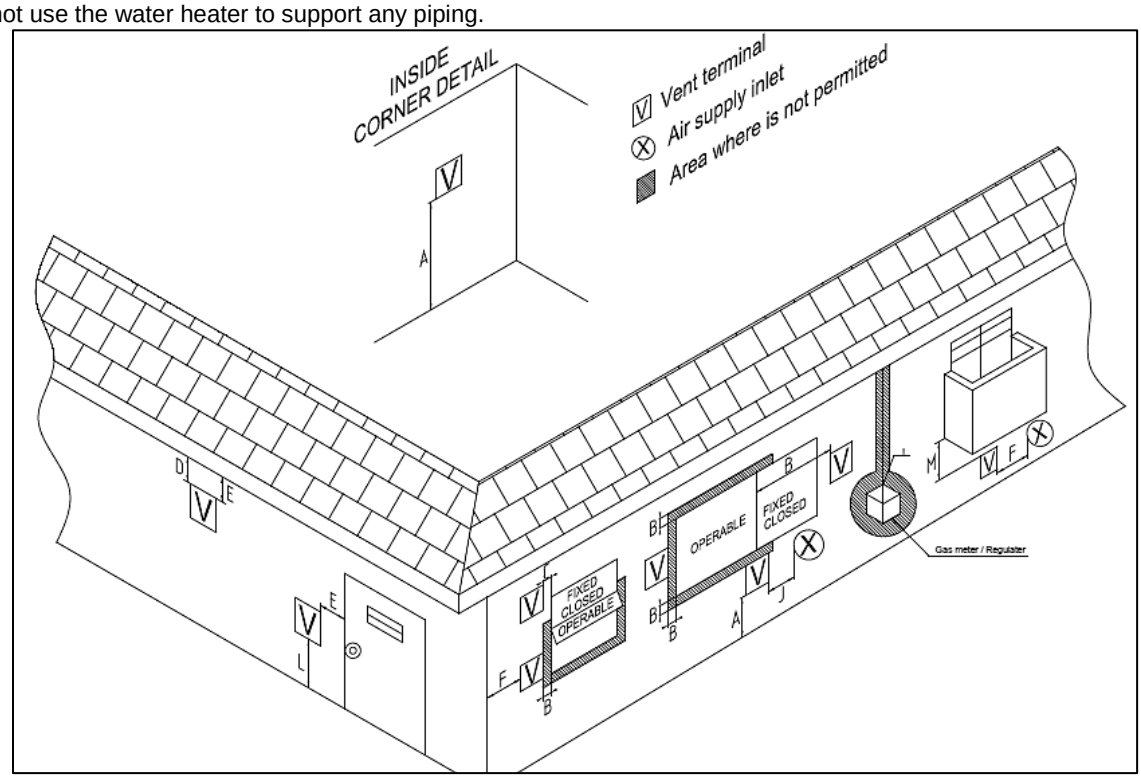


Figure 5 – Vent Termination Detail

	DESCRIPTION	US	CANADA
A	Clearance above grade, veranda, porch, deck, or balcony	1 foot	1 foot
B	Clearance to window or door that may be opened	1 foot	3 feet
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet from the center line of the terminal	*	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	*	*
H	Clearance to each side of center line extended above meter / regulator assembly	*	3 feet with a height 15 feet above meter / regulator assembly
I	Clearance to service regulator vent outlet	*	3 feet
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	1 foot	3 feet
K	Clearance to a mechanical air supply inlet	3 feet above if within 10 feet horizontally	6 feet
L	Clearance above paved sidewalk or driveway located	*	7 feet
M	Clearance under veranda, porch, deck, or balcony	*	1 foot

Table 8 – Vent Termination Clearances - *NOTE: For clearances not specified in ANSI Z223.1/NFPA 54 or CAN/CSA-B 149.1, please use clearances in accordance with local installation codes and the requirements of the gas supplier.

B. APPROVED VENT MATERIALS

NOTICE

Consult Table 9 or the most recent edition of ANSI Z223.1/NFPA 54 or CAN/CGA B149.1 as well as all applicable local codes and regulations when selecting vent pipe materials.

APPROVED EXHAUST VENT AND INTAKE PIPE MATERIAL			
Item	**Material**	**Standards for Installation in:**	
		United States	**Canada**
Exhaust vent or Intake pipe and fittings	CPVC schedule 40	ASTM-D2846	PP, CPVC, and PVC venting must be ULC-S636 Certified. IPEX is an approved manufacturer in Canada, supplying vent material listed to ULC-S636.
	PVC schedule 40	ANSI/ASTM D1785	
	Polypropylene	ULCS636	
	Stainless Steel AL29-4C	Certified for Category IV and direct vent appliance venting	Certified for Category IV and direct vent appliance venting
Pipe cement/primer	PVC	ANSI/ASTM D2564	IPEX System 636 Cements & Primers
	CPVC	ANSI/ASTM F493	

⚠ DANGER

- This water heater has a built-in control to limit the exhaust temperature to 149°F (65°C).
- The exhaust and intake components installed with this water heater must be used for near water heater piping BEFORE transitioning to the approved materials listed above. DO NOT REMOVE these installed components. Doing so WILL VOID warranty.
- PVC/CPVC pipe and fittings of the same diameter are considered interchangeable.
- DO NOT use Foam Core Pipe (CPVC cellular core, Radel, etc.) in any portion of the exhaust piping from this water heater.
- DO NOT connect PVC/CPVC to PP without an approved vent connector.
- When installing AL29-4C vent piping, install a PVC-to-stainless adapter at the water heater vent connection, and at the termination when using an Westinghouse PVC termination kit. DO NOT mix AL-29-4C piping from different manufacturers unless using adapters specifically designed for the purpose by the manufacturer.
- DO NOT insulate non-metallic exhaust vent pipe or fittings.
- DO NOT obstruct the flow of combustion or ventilation air.
- When using Pipe Cement/Primer, follow the instructions included with the Cement/Primer closely. Clean and dry all applicable surfaces before applying.

Failure to follow these directions will result in substantial property damage, severe personal injury, or death.

Table 9 – Approved Venting Materials

CAUTION

High heat sources (sources generating heat 100°F / 37°C or greater, such as stove pipes, space heaters, etc.) may damage plastic components of the boiler as well as plastic vent pipe materials. Such damages ARE NOT covered by warranty. It is recommended to keep a minimum clearance of 8" from high heat sources. Observe heat source manufacturer instructions, as well as local, state, provincial, and national codes, laws, regulations and ordinances when installing this boiler and related components near high heat sources.

⚠ WARNING

Vent adaptors are not designed as load-bearing devices, and must not be used to support exhaust vent piping. All vent pipes must be properly connected, supported, and the exhaust must be pitched a minimum of ¼" per foot back to the heater to allow drainage of condensate. Failure to properly support vent piping and follow the information in this statement could result in product damage, severe personal injury, or death.

C. ALLOWED SCHEDULE 40 VENT LENGTHS (PVC, CPVC, PP)

2" COMBUSTION AIR / VENT PIPE		3" COMBUSTION AIR / VENT PIPE	
MAX	**MAX ALLOWED NUMBER OF ELBOWS**	**MAX**	**MAX ALLOWED NUMBER OF ELBOWS**
15' (4.5M)	2	100' (30M)	6

Table 10 – Approved Vent Lengths

NOTE: When using more than 1 elbow, reduce maximum allowable length:

- 5 feet (1.5M) for each additional 3" 90° elbow
- 2.5 feet (.75M) for each additional 3" 45° elbow
- 8 feet (2.4M) for each additional 2" 90° elbow
- 4 feet (1.2M) for each additional 2" 45° elbow

D. TIGHTENING WATER HEATER COLLAR TO EXHAUST VENT AND INTAKE PIPE

This appliance uses 2" or 3" diameter pipe for exhaust vent and intake pipe. In order to use 2" pipe, it is required to reduce pipe size in a vertical length of pipe with a reducing coupling (not included). Follow the steps below to install 3" pipe into the appliance collar. See Figure 6 for additional details.

1. Clean and dry the appliance connection. DO NOT use primer or cement on the appliance connection.
2. Push the length of pipe into the connection until it touches the bottom of the fitting.
3. Tighten the clamps using a screwdriver.
4. Ensure the pipe is secure before continuing installation.
5. For 2" installations, install a reducing coupling in a vertical section of pipe. See Figure 7.

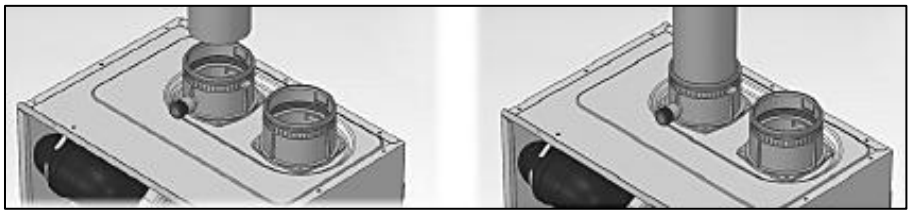


Figure 6 – Correct Installation into the Water heater Collar

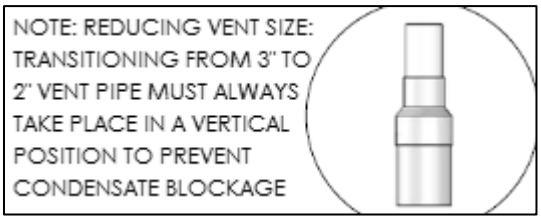


Figure 7 – Transitioning from 3" to 2" Vent Pipe

E. VENT TERMINATION

1. Two Pipe Roof and Sidewall Vent Terminations

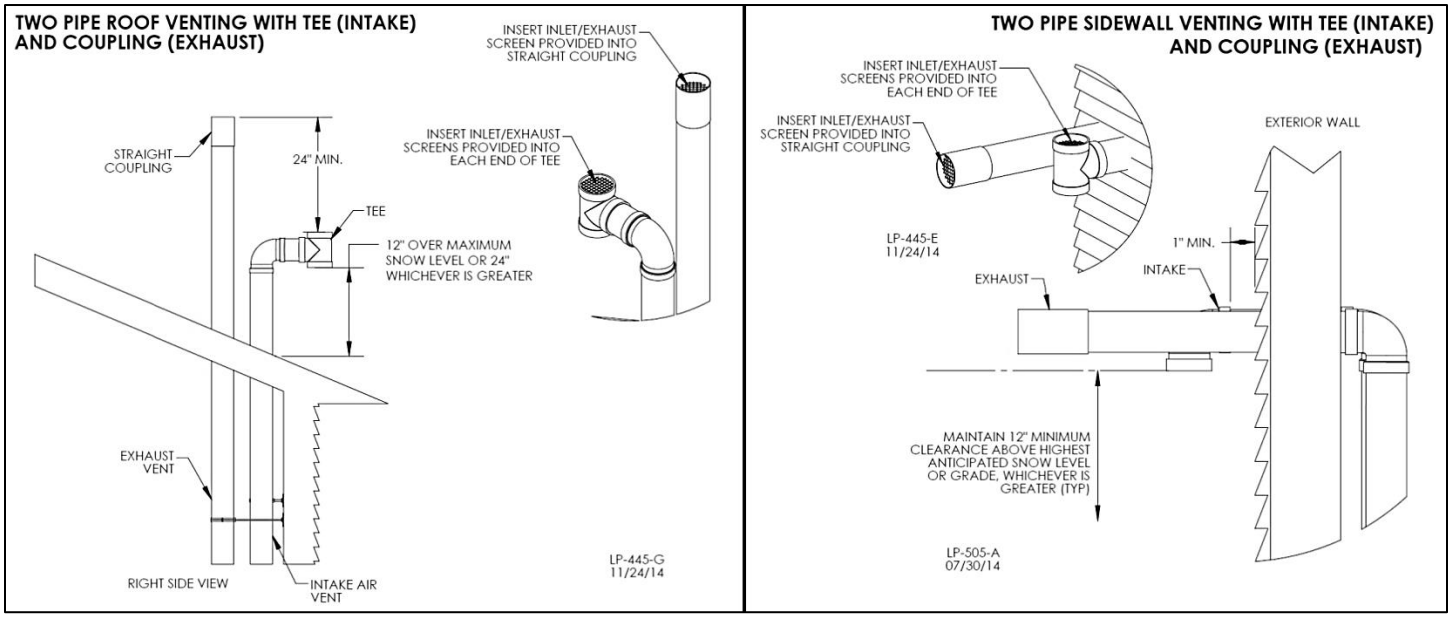


Figure 8 – Direct Vent, Roof and Sidewall Vent Terminations

⚠ WARNING

All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of ¼" per foot back to the appliance to allow drainage of condensate. When placing support brackets on vent piping, the first bracket must be within 1 foot of the appliance and the balance at 4 foot intervals on the vent pipe. Appliance venting must be readily accessible for visual inspection for the first three feet from the appliance.

2. Direct Vent, Optional Horizontal and Vertical Vent Kits

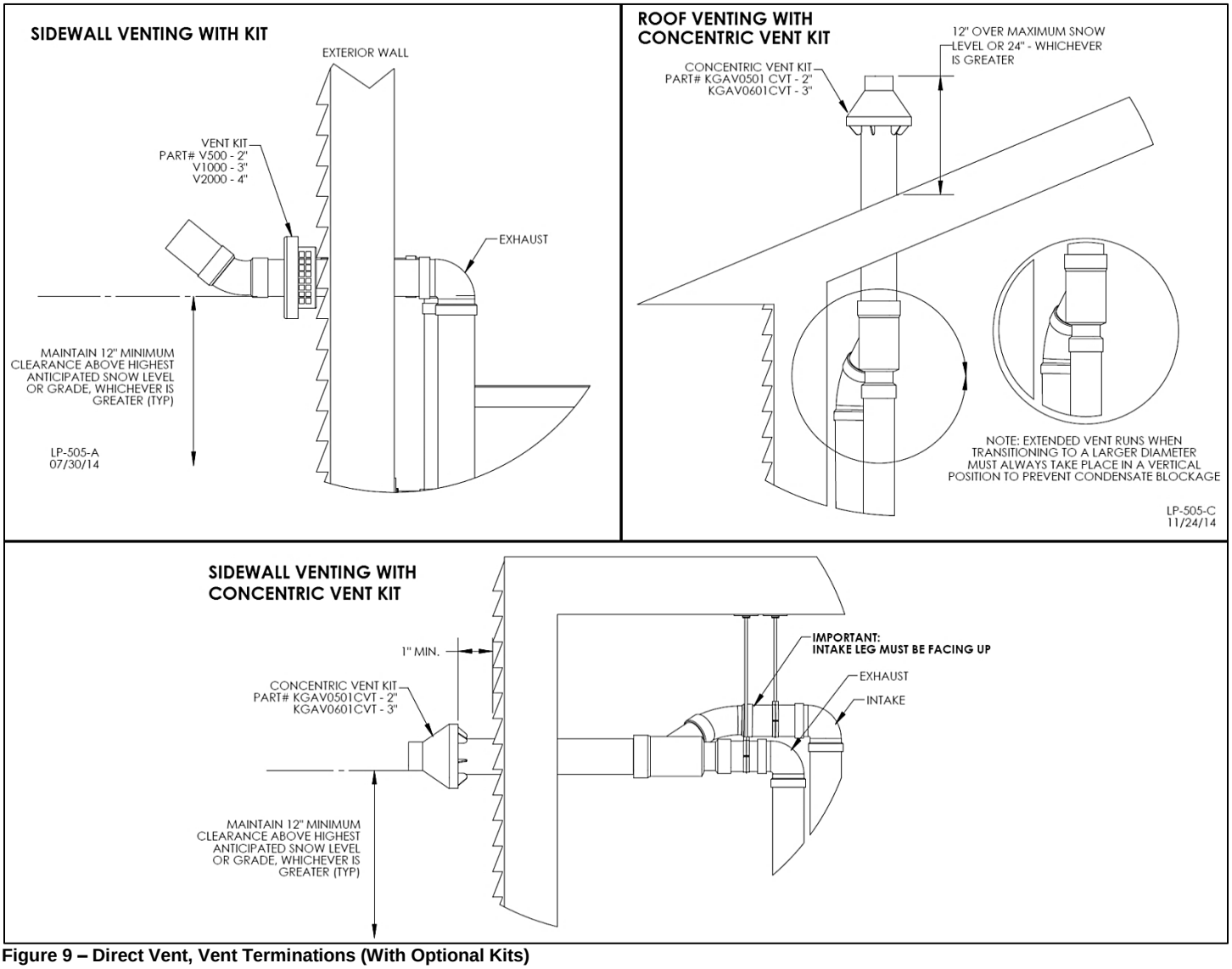

SIDEWALL VENTING WITH KIT
EXTERIOR WALL
VENT KIT
PART# V500 - 2"
V1000 - 3"
V2000 - 4"
EXHAUST
MAINTAIN 12" MINIMUM CLEARANCE ABOVE HIGHEST ANTICIPATED SNOW LEVEL OR GRADE, WHICHEVER IS GREATER (TYP)
LP-505-A
07/30/14
ROOF VENTING WITH CONCENTRIC VENT KIT
12" OVER MAXIMUM SNOW LEVEL OR 24" - WHICHEVER IS GREATER
CONCENTRIC VENT KIT
PART# KGAV0501 CVT - 2"
KGAV0601CVT - 3"
NOTE: EXTENDED VENT RUNS WHEN TRANSITIONING TO A LARGER DIAMETER MUST ALWAYS TAKE PLACE IN A VERTICAL POSITION TO PREVENT CONDENSATE BLOCKAGE
LP-505-C
11/24/14
SIDEWALL VENTING WITH CONCENTRIC VENT KIT
1" MIN.
CONCENTRIC VENT KIT
PART# KGAV0501CVT - 2"
KGAV0601CVT - 3"
IMPORTANT:
INTAKE LEG MUST BE FACING UP
EXHAUST
INTAKE
MAINTAIN 12" MINIMUM CLEARANCE ABOVE HIGHEST ANTICIPATED SNOW LEVEL OR GRADE, WHICHEVER IS GREATER (TYP)

Figure 9 – Direct Vent, Vent Terminations (With Optional Kits)

⚠ WARNING

All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of ¼" per foot back to the appliance to allow drainage of condensate. When placing support brackets on vent piping, the first bracket must be within 1 foot of the appliance and the balance at 4 foot intervals on the vent pipe. Appliance venting must be readily accessible for visual inspection for the first three feet from the appliance.

3. Screen Installation

After connecting the intake air and exhaust vent pipes, it is required to install the included screens into the exhaust vent and intake pipe terminations to prevent damages to the unit due to blockages. See Figure 10 for installation detail.

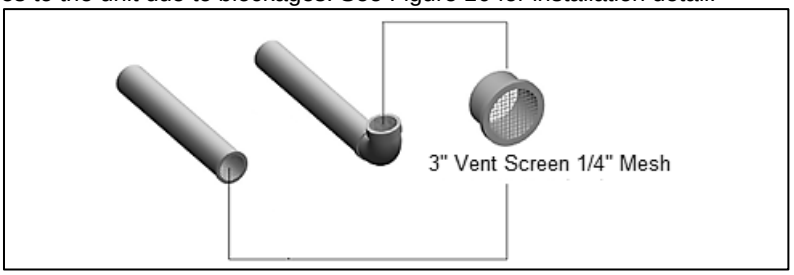


Figure 10 - Screen Installation - NOTE: Vent termination elbow is meant to be installed open end facing the ground. Orientation in Figure 10 is meant to demonstrate proper Vent Screen installation ONLY.

SAFETY INSTRUCTIONS
Do not connect any other appliance vents to the water heater exhaust vent or intake pipes.

PART 6 – INSTALL THE CONDENSATE DRAIN

1. Due to its efficient design, the water heater produces condensate (water) as a normal by-product. This condensate is acidic, with a pH level between 3 and 4. This condensate must be drained away from the water heater and disposed in accordance with all local regulations.

2. Use corrosion-resistant materials to drain condensate. Use the included flexible plastic hose or ½" PVC and CPVC drain pipe complying with ASTM D1785, F441, or D2665 may be used. Cement and primer must comply with ASTM D2564 or F493. For Canadian applications, use CSA or ULC certified PVC or CPVC pipe, fittings, and cement.

3. Local building codes may require an in-line neutralizer (1) to be installed (not included) to treat the condensate. Follow all the installation instructions included with the neutralizer. If a neutralizer is installed, periodic replacement of the limestone (or neutralizing agent) will be required. The rate of depletion of the limestone varies with usage of the water heater. During the first year of water heater operation, check the neutralizer every few months for depletion.

4. Route the drain line to a nearby floor drain (2), laundry tub (3), or condensate pump (4).

NOTE: If a nearby laundry tub is used as a disposal for waste water from the washing machine, draining the condensate into this tub allows the soapy water discharge to neutralize the acidic condensate.

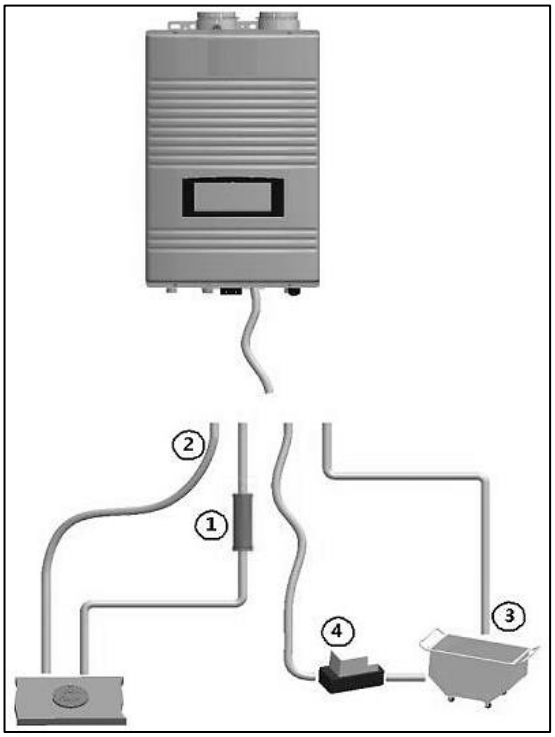


Figure 11 – Condensate Detail

6. An error will appear on the water heater display if condensate line is blocked. The water heater will not operate with a blocked condensate line. It is extremely important to have this condition repaired by a qualified service technician.

PART 7 – GAS PIPING

⚠ WARNING
FIRE AND/OR EXPLOSION HAZARD To avoid serious injury or death, the gas line installation and the gas line inlet pressure test must be done by a licensed professional.
Always match the water heater with the type of gas supplied to the unit (natural gas or LP gas). This water heater must be converted into propane operation unless specifically manufactured for use with propane. Follow Gas Conversion Manual instructions (separate document). Propane ready water heaters have the suffix "LP" after the model serial number.
Make sure the gas line pressures are within normal limits. Pressures outside normal limits can result in poor performance and hazardous operating conditions.
This water heater must be converted into propane operation unless it is specifically manufactured to operate on propane. Propane-ready water heaters have the suffix "LP" after the model serial number. Failure to ensure the water heater is set to operate on the provided gas supply could result in property damage, personal injury, or death.

A. GAS PIPE SIZING TABLES

1. Gas Pipe Sizing

This information is for reference use only. Refer to gas pipe manufacturer specifications for actual delivery capacity. The DOE standard for Natural Gas is 1100 BTU/ft^3. Contact the local gas supplier for actual BTU/ft^3 rating.

2. Natural Gas Pipe Sizing

The following tables list maximum capacity of pipe in cubic feet of gas per hour for gas pressures of 14" or less and a pressure drop of 0.5 inches water column, based on a 0.60 specific gravity for natural gas.

Maximum Natural Gas Delivery Capacity – Length of Corrugated Stainless Steel Pipe in Feet										
Pipe Size	**Cubic Feet per Hour (0.60 Specific Gravity, 0.5 WC Pressure Drop)**									
	10	**20**	**30**	**40**	**50**	**60**	**80**	**100**	**150**	**200**
½"	82	58	47	41	37	37	29	26	20	18
¾"	192	137	112	97	87	80	69	62	48	44
1"	383	269	218	188	168	153	132	118	91	82
1 ¼"	639	456	374	325	292	267	232	208	171	148
1 ½"	1260	888	723	625	559	509	440	393	320	277
2"	2930	2080	1700	1470	1320	1200	1040	933	762	661

Table 11 – Natural Gas Delivery Capacity – Corrugated Stainless Steel Pipe – Refer to ANSI Z223.1 – National Fuel Gas Code, Latest Edition

Maximum Natural Gas Delivery Capacity – Length of Black Iron Pipe (Sch. 40 Metallic) in Feet										
Pipe Size	**Cubic Feet per Hour (0.60 Specific Gravity, 0.5 WC Pressure Drop)**									
	10	**20**	**30**	**40**	**50**	**60**	**80**	**100**	**150**	**200**
½"	172	118	95	81	72	65	56	50	40	34
¾"	360	247	199	170	151	137	117	104	83	71
1"	678	466	374	320	284	257	220	195	157	134
1 ¼"	1390	957	768	657	583	528	452	400	322	275
1 ½"	2090	1430	1150	985	873	791	677	600	482	412
2"	4020	2760	2220	1900	1680	1520	1300	1160	928	794

Table 12 – Natural Gas Delivery Capacity – Black Iron Pipe – Refer to ANSI Z223.1 – National Fuel Gas Code, Latest Edition

3. LP (Liquid Propane) Gas Pipe Sizing

The following is intended for use for piping between a Single or Second Stage (Low Pressure) Regulator and the water heater. The following tables list maximum capacity of pipe in cubic feet of gas per hour for an inlet pressure of 11 inches water column and specific pressure drop of 0.5 inches water column based on 1.5 specific gravity for liquid propane.

Maximum Liquid Propane Delivery Capacity – Length of Corrugated Stainless Steel Pipe in Feet										
Pipe Size	**Cubic Feet per Hour (0.60 Specific Gravity, 0.5 WC Pressure Drop)**									
	10	**20**	**30**	**40**	**50**	**60**	**80**	**100**	**150**	**200**
½"	129	91	74	64	58	53	45	41	31	28
¾"	303	216	177	153	137	126	109	98	75	69
1"	605	425	344	297	265	241	208	186	143	129
1 ¼"	971	661	528	449	397	359	307	270	217	183
1 ½"	1990	1400	1140	988	884	805	696	621	506	438
2"	4640	3290	2680	2330	2080	1900	1650	1480	1210	1050

Table 13 – Liquid Propane Delivery Capacity – Corrugated Stainless Steel Pipe – Refer to ANSI Z223.1 – National Fuel Gas Code, Latest Edition

Maximum Liquid Propane Delivery Capacity – Length of Black Iron Pipe (Sch. 40 Metallic) in Feet										
Pipe Size	**Cubic Feet per Hour (0.60 Specific Gravity, 0.5 WC Pressure Drop)**									
	10	**20**	**30**	**40**	**50**	**60**	**80**	**100**	**150**	**200**
½"	291	200	160	137	122	110	101	94	84	67
¾"	608	418	336	287	255	231	212	197	175	140
1"	1150	787	632	541	480	434	400	372	330	265
1 ¼"	2350	1620	1300	1110	985	892	821	763	677	543
1 ½"	3520	2420	1940	1660	1480	1340	1230	1140	1010	814
2"	6790	4660	3750	3210	2840	2570	2370	2200	1950	1570

Table 14 – Liquid Propane Delivery Capacity – Black Iron Pipe – Refer to ANSI Z223.1 – National Fuel Gas Code, Latest Edition

B. GAS CONNECTION REQUIREMENTS

1. The gas connection fitting on the water heater is ¾" female NPT. **NOTE:** The pipe size must not be less than ¾".

2. The supply line must be sized for the maximum output of the water heater being installed. If there are additional gas appliances from the main supply line, measure the size of the supply line according to the COMBINED total maximum BTUH draw for the appliances as if they were operating at the same time.

3. Measure the length of the gas supply line from the gas meter to the water heater. Water heater must be installed downstream of the gas meter to ensure adequate gas supply. Use the tables in this manual or refer to the gas line manufacturer's sizing information to determine the correct supply pipe size.

4. A manual gas shut-off valve should be installed in the gas supply line close to the water heater. See Figure 12 for detail.

5. To facilitate any future maintenance, it is also recommended that an approved gas union fitting be installed in the supply line between the shut-off valve and the ¾" female NPT connection on the water heater.

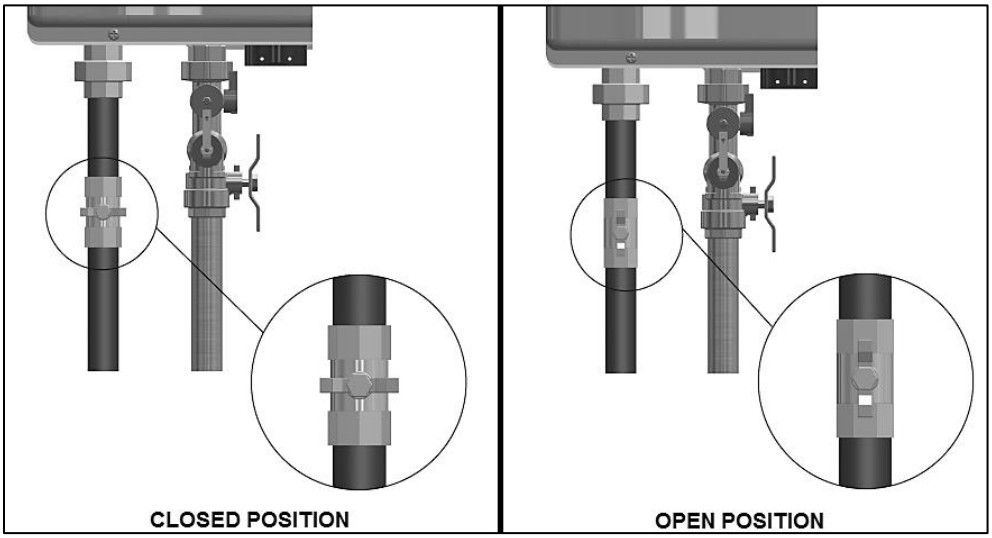


Figure 12 – Gas Line With Shut-Off Valve Detail

6. Test the gas pressure to make sure it meets the minimum standards and does not exceed the maximum standards of the water heater.

7. Leak test the gas line pipe before placing the water heater in operation. Only use approved leak detector liquid solutions to check for leaks.

8. Do not operate the water heater until all connections have been completed and the heat exchanger is filled with water.

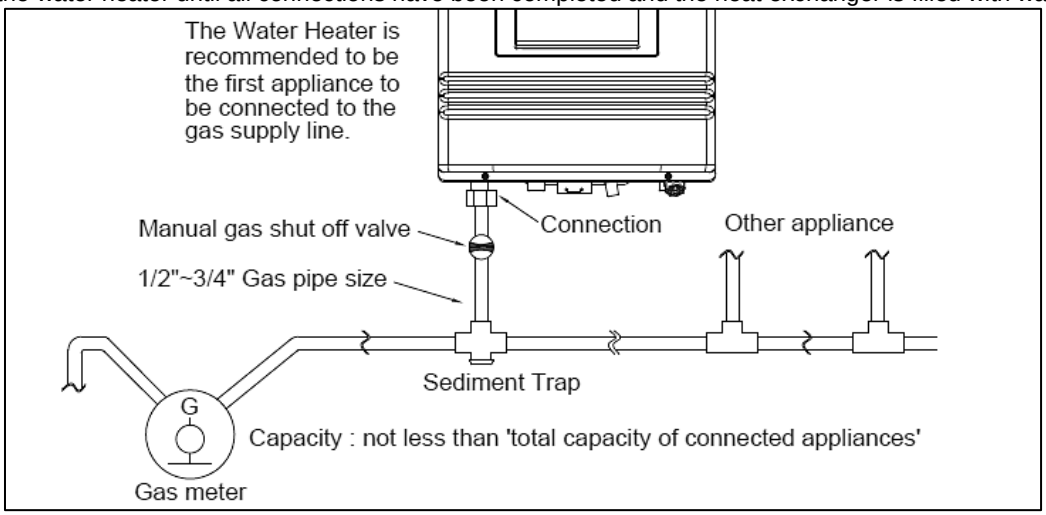

The Water Heater is recommended to be the first appliance to be connected to the gas supply line.
Manual gas shut off valve
Connection
Other appliance
1/2"~3/4" Gas pipe size
Sediment Trap
G
Capacity : not less than 'total capacity of connected appliances'
Gas meter

Figure 13 – Natural Gas Piping Installation – NOTE: Capacity to be not Less than Total Capacity of Connected Appliances

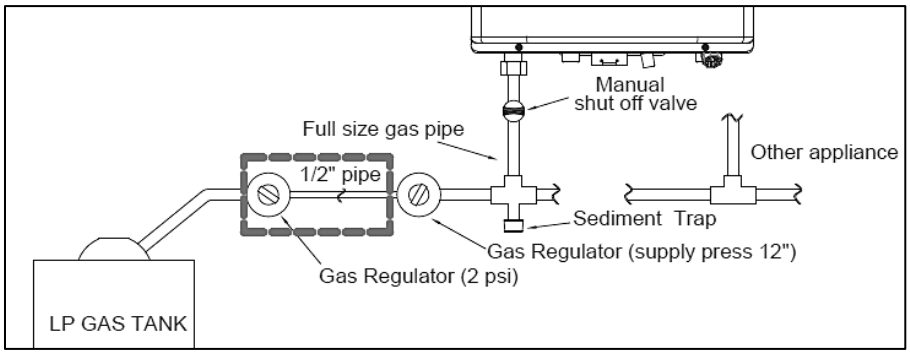


Figure 14 – LP Gas Piping Installation – NOTE: Capacity to be Not Less than Total Capacity of Connected Appliances

C. ADJUSTING GAS PRESSURE AT THE WATER HEATER

NOTE: Refer Figure 15 when adjusting gas pressure. Loosen the bolts before checking the gas inlet pressure.

1. The water heater and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of the system at test pressures greater than ½ psi (3.5 kPa).

2. The water heater must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than ½ psi (3.5 kPa).

The minimum and maximum inlet gas line pressures must meet the requirements shown in Table 15.

LP GAS		NATURAL GAS	
Minimum Pressure	3.5” WC	Minimum Pressure	3.5” WC
Maximum Pressure	14” WC	Maximum Pressure	14” WC

Table 15 – Gas Pressure Requirements

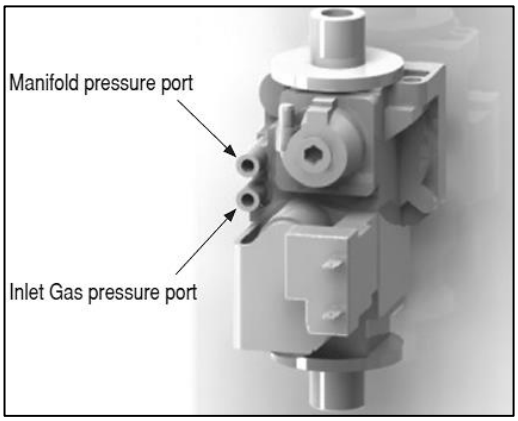


Figure 15 – Inlet Gas Pressure Port Detail

NOTICE

Do not fire (operate) the water heater until all connections have been completed and the heat exchanger is filled with water. Doing so will damage the water heater and void the warranty.

PART 8 – WATER PIPING

A. GENERAL PLUMBING CONNECTION GUIDELINES

- Pipe material must be suitable to meet local codes and industry standards.
- The pipe must be cleaned and without blemish before any connections are made.
- Do not apply a torch within 12” of the bottom connections of the water heater. Doing so could damage the water heater. Such damages ARE NOT covered by product warranty.
- The size of the hot water pipe should be ¾” diameter.
- Isolation (shutoff valves) should be used to ease future servicing.
- All piping should be insulated.

B. INSTALL A BACKFLOW PREVENTER

It may be recommended to use a back flow preventer – check local codes. If a back flow preventer or a no return valve is used, a thermal expansion tank must be installed on the cold water supply between the water heater and valve.

⚠ WARNING

To control thermal expansion, a thermal expansion tank should be installed in systems with an installed backflow preventer. DO NOT use a closed type expansion tank. Follow expansion tank manufacturer’s specifications to properly size an expansion tank to the installation. Failure to properly accommodate thermal expansion could result in property damage, severe personal injury, or death.

C. PIPING THE WATER HEATER

CAUTION

Use at least the MINIMUM pipe size for all water heater loop piping This is to avoid the possibility of inadequate flow through the water heater. Using less than the required minimum pipe size and piping could result in system problems, property damage, and premature water heater failure. Such problems ARE NOT covered by product warranty.

Use both thread tape and pipe dope to connect to the ¾” domestic water inlet and outlet. Tankless isolation valves between the city water supply and tank inlet are recommended for ease of service.

D. PIPING DIAGRAM

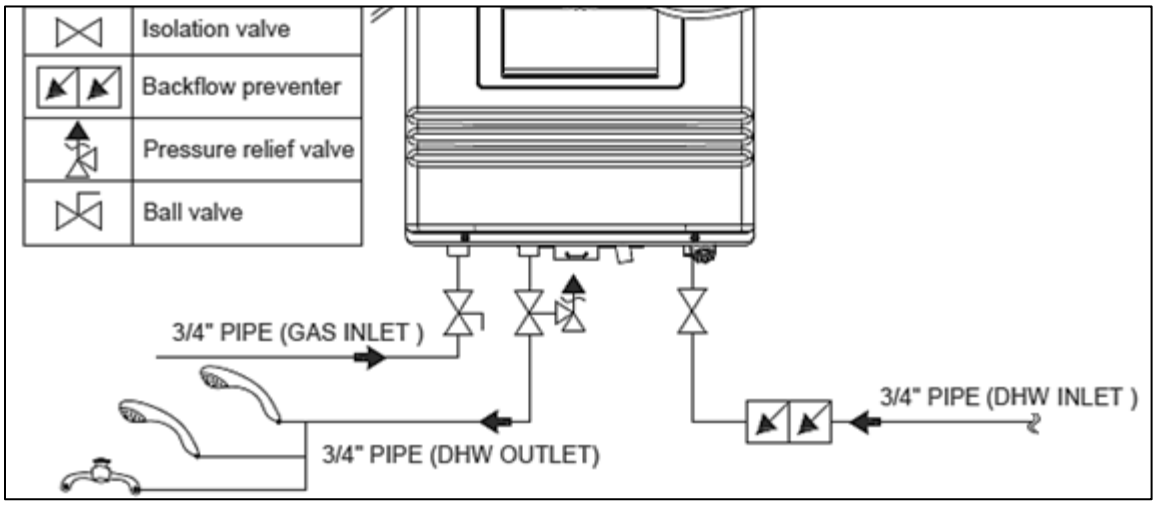


Figure 16 – DHW Piping

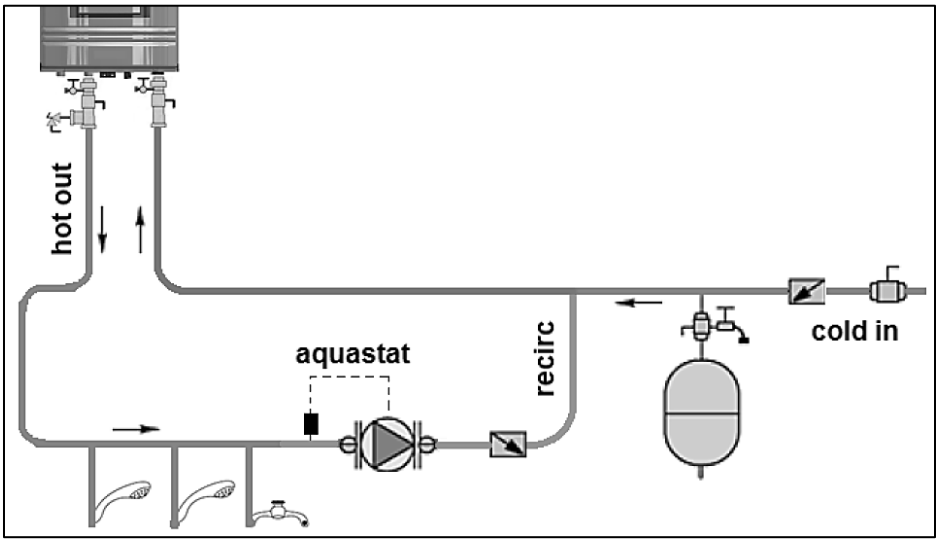


Figure 17 – Piping with Recirculation

E. PRESSURE RELIEF VALVE

An external pressure relief valve must be installed on this water heater. When installing, observe the following guidelines. Failure to comply with these guidelines can result in substantial property damage, personal injury, or death.

This water heater must be provided with an approved 150 psi, ¾" ASME HV Valve that must be installed on the DHW outlet line (See Figure 18). The 150 psi Pressure Relief Valve must be installed on the DHW supply line to ensure a compliant installation and safe operation.

This water heater has a high-temperature shut-off switch built in as a standard safety feature. Therefore, a "pressure only" relief valve is required. DO NOT operate this water heater before the supplied pressure relief valve is installed with sufficient relieving capacity in accordance with the ASME rating plate on the water heater.

Pressure relief valves must be installed as close to the water heater as possible. No other valves should be placed between the pressure relief valve and the appliance. DO NOT install a relief valve with a pressure rating greater than 150 psi. This is the maximum allowable relief valve setting for this water heater.

After installing the relief valve and filling and pressurizing the system, test the operation of the valve by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, replace it with a new relief valve. Ensure that the

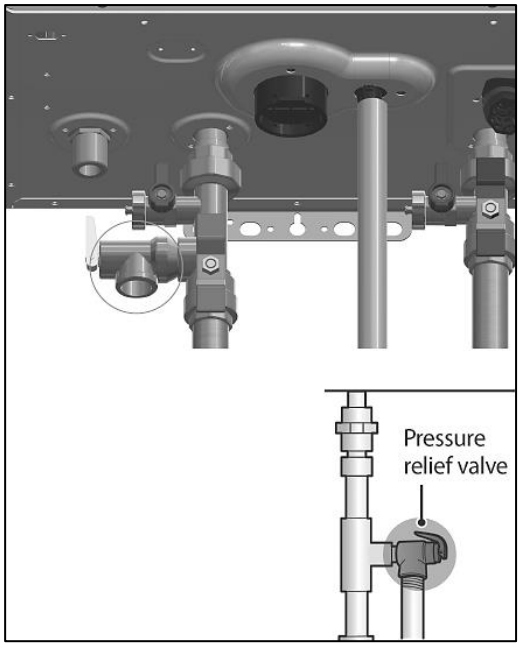


Figure 18 – Relief Valve Details

maximum BTU/H rating on the pressure relief valve is equal to or greater than the maximum input BTU/H rating of the combination water heater.

⚠ WARNING

To avoid water damage or scalding due to relief valve operation:

- Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the relief valve discharge.
- Discharge line must be as short as possible and the same size as the valve discharge connection throughout its entire length.
- Discharge line must pitch downward from the valve and terminate at least 6" above the floor drain, making discharge clearly visible.
- Discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375^{o}F or greater.
- Do not pipe discharge to any location where freezing could occur.
- No shutoff valve may be installed between the relief valve and water heater or in the discharge line. Do not plug or place any obstruction in the discharge line.
- Test the operation of the relief valve after filling and pressurizing the system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, replace it with a new relief valve.
- Test relief valve at least once annually to ensure the waterway is clear. If valve does not operate, turn the water heater "off" **and call a plumber immediately.**
- Take care whenever operating relief valve to avoid scalding injury or property damage.
- For water heaters installed with only a pressure relief valve, the separate storage vessel must have a temperature and pressure relief valve installed. This relief valve shall comply with *Relief Valves for Hot Water Supply Systems, ANSI Z21.22 CSA4.4.*

FAILURE TO COMPLY WITH THE ABOVE GUIDELINES COULD RESULT IN FAILURE OF RELIEF VALVE OPERATION, RESULTING IN POSSIBILITY OF SUBSTANTIAL PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.

PART 9 – CONNECT ELECTRICAL POWER / INITIAL STARTUP

⚠ WARNING

Install wiring and electrically ground water heater in accordance with the authority having jurisdiction or, in the absence of such an authority, follow the National Electrical Code, NFPA 70, and/or CSA C22.1 Electrical Code-Part 1 in Canada. Failure to follow all applicable local, state, and national regulations, mandates, and building supply codes for guidelines to install the electrical power supply could result in property damage, serious personal injury, or death.

⚠ WARNING

ELECTRICAL SHOCK HAZARD – To ensure safety, turn off electrical power supply at service entrance panel before making any electrical connections to avoid possible electric shock hazard. Failure to do so could result in property damage, serious personal injury, or death.

A. WIRING INFORMATION

1. This water heater must be properly grounded. Ensure the electrical receptacle that the water heater will be plugged into is properly grounded.

2. Do not attach the ground wire to either the gas or water piping.

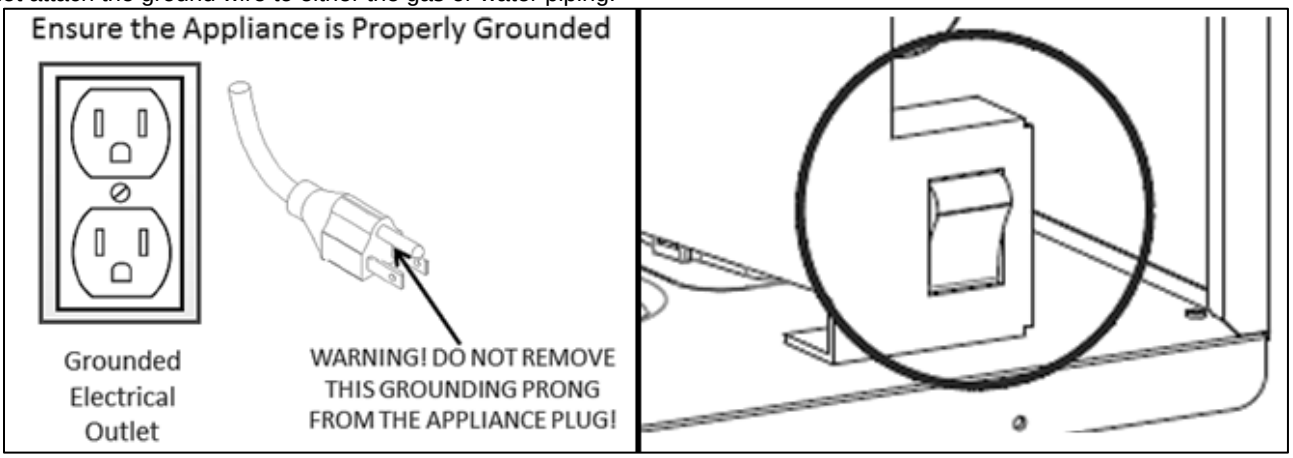

Ensure the Appliance is Properly Grounded
Grounded Electrical Outlet
WARNING! DO NOT REMOVE THIS GROUNDING PRONG FROM THE APPLIANCE PLUG!

Figure 19 – Proper Grounding – Internal Manual Power Switch

3. The wiring diagrams contained in this manual are to be used for reference purposes only.

4. Refer to these diagrams and the wiring diagrams of any external controls used with the installation when wiring the water heater. Read, understand, and follow all wiring instructions supplied with the controls.

5. Do not disconnect the power supply when the water heater is in normal operation.

NOTE: For additional electrical protection, the use of a whole house surge protector is recommended. Damage caused by power surges is not covered by the warranty.

NOTICE

If the water heater display does not come ON, first check the plug. Also check the electrical panel circuit breaker and reset it if necessary. If the circuit breaker trips again, do not reset. Disconnect the plug and have a qualified technician diagnose the problem.

B. DIP SWITCHES

There is one DIP switch. DIP switches 6 and 7 need to be set to OFF for the water heater to operate normally.

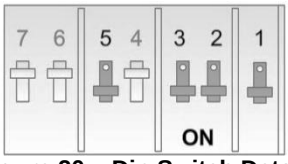


Figure 20 – Dip Switch Detail

DIP SWITCH GROUP

DIP SWITCH		OFF	ON
1 – 3	NOT USED	NOT USED	
4	NOT USED	NOT USED	
5	Gas Type	LP	NG
6	High Fire	Normal	High Fire
7	Low Fire	Normal	Low Fire

Table 16 – DIP Switch Group

SYSTEM CONTROL SETTINGS

MAXIMUM FLAME DETECTING VOLTAGE	2.5V
PRE-PURGE TIME (Tp)	Maximum 10 seconds, minimum 1 second
SAFETY TIME (IGNITING TIME) (Ts)	3.5 seconds
IGNITING INTERVAL TIME	<10 seconds
POST-PURGE TIME (Tip)	3 minutes
OVER-HEATING 1,2,3 PROTECTION DETECTION TIME	<1 seconds
TEMPERATURE SENSOR FAULT DETECTION TIME	<2 seconds
# OF IGNITION ATTEMPTS (Ntl)	10
DHW SET TEMPERATURE RANGE	95^{o}F (35^{o}C) - 140^{o}F (60^{o}C)
DHW OFF TEMPERATURE	DHW Target Temperature + DHW Differential Temperature 50^{o}F (10^{o}C)
DHW ON TEMPERATURE	Below DHW Target Temperature 41^{o}F (5^{o}C)
DHW WATER ON MINIMUM WATER FLOW	.5 gallons (2 liters) (12Hz)
DHW WATER OFF MINIMUM WATER FLOW	.4 gallons (1.5 liters) (8Hz)

Table 17 – System Control Settings

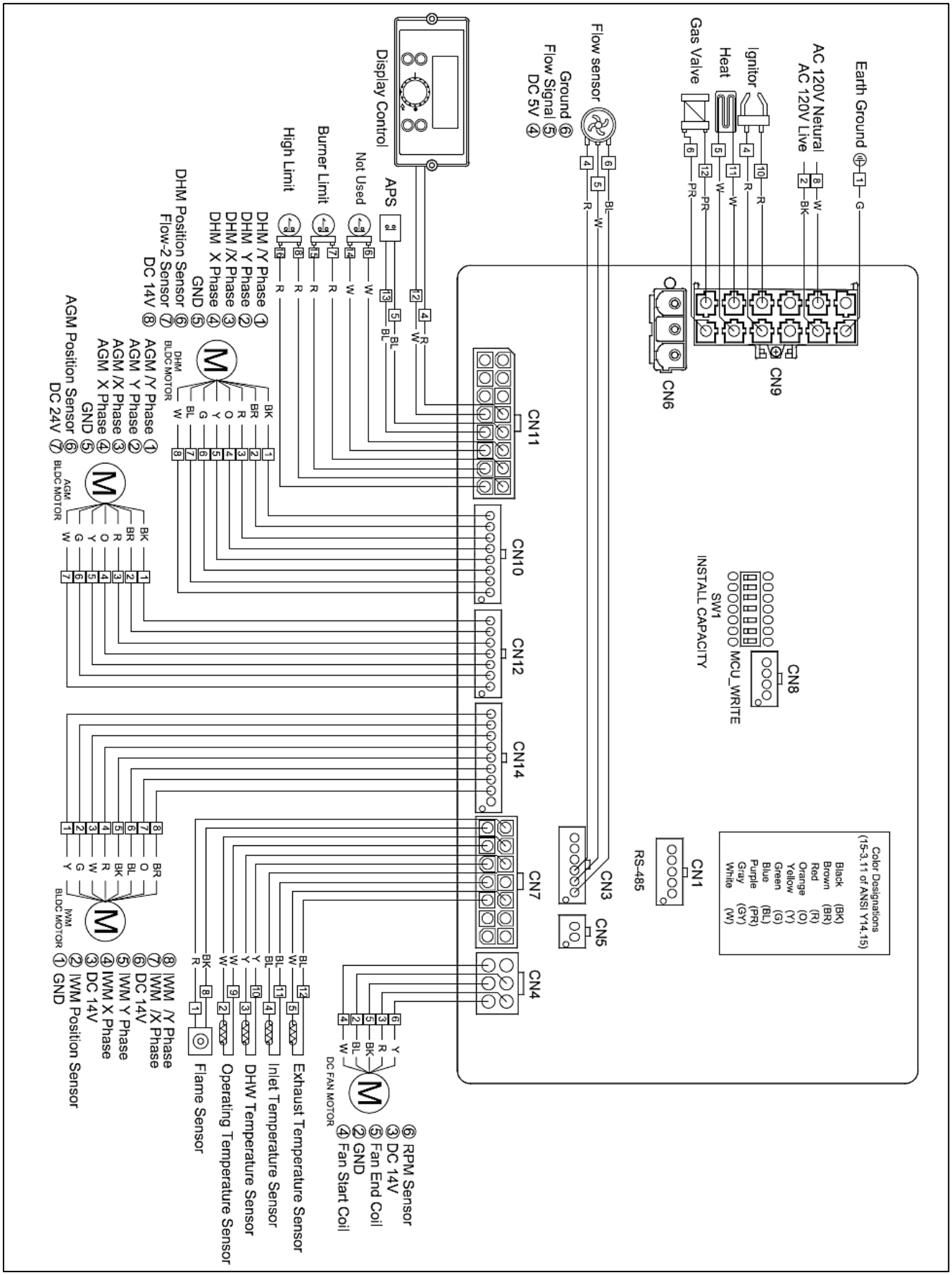


Figure 21 – Electrical Wiring Diagram

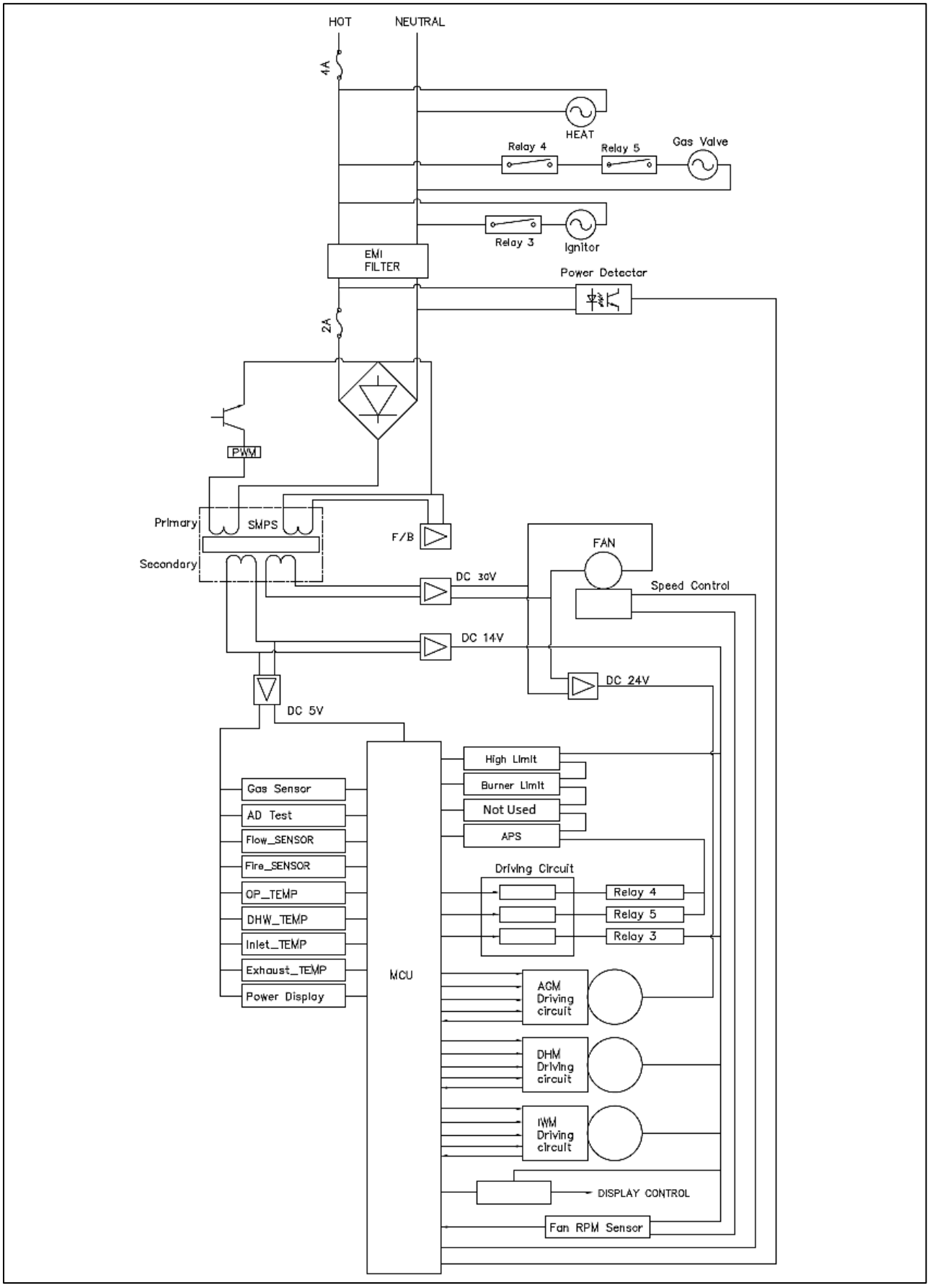


Figure 22 – Ladder Diagram

CONNECTOR			DESCRIPTION	HT SELV
NO. OF LOCATION	PIN	BOARD SILK		
CN9 65001WS-12	1	-	UNUSED	-
	2	L	Power Supply Line	HT (120V~)
	3	CP1	UNUSED	
	4	IT	Ignitor	
	5	L(HT)	Ceramic Heater (Freeze Protection)	
	6	GV	Gas Valve	
	7	⏚	EARTH GROUND	
	8	N	Power Supply Neutral	
	9-12	⎵N⎵	AC Power COM Line	
CN1 SMW250-03	1	RS-485	RS485 +	SELV (5V)
	2		GND	
	3		RS485 -	
CN4 LWD1140-06	1	FAN	Unused	-
	2		GND	SELV (30V)
	3		VDD	SELV (14V)
	4		Fan power (start coil)	SELV (30V)
	5		Fan power (end coil)	
	6		Fan speed feedback signal	SELV (14V)
CN8 SMW250-04	1	MCU ISP	GND	SELV (5V)
	2		ISP / Reset Port	
	3		ISP TOOL0 Data Port	
	4		VCC	
CN11	1	HWL	Unused	-
	8			
	2	LWL	Unused	
	10			
	3	HD	Unused	
	11			
	4	TH	Connect to the Display Control (Thermostat)	SELV (14V)
	12			
	5	APS	Air Pressure Switch	
	13			
	6	EL	Unused	
	14			
	7	BL	Burner Limit	
	15			
	8	HL	High Limit	
	16			

Table 18 – Water Heater Wiring 1

CONNECTOR			DESCRIPTION	HT SELV
NO. OF LOCATION	PIN	BOARD SILK		
CN7 LWD1140-14	1	F.S	Flame Detect Sensor	SELV (5V)
	8			
	2	OP.S	Operating Water Temperature Sensor	
	9			
	3	DH.S	DHW Temperature Sensor	
	10			
	4	I.S	Inlet Water Temperature Sensor	
	11			
	5	BG.S	Exhaust Temperature Sensor	
	12			
	6	ST.S	Unused	
	13			
	7	SP.S	Unused	
	14			
CN12 SMW250-07	1	AGM	AGM Stepper Motor Coil / Y Phase	SELV (24V)
	2			
	3		AGM Stepper Motor Coil / X Phase	
	4			
	5		GND	
	6		AGM Stepper Motor Position	SELV (14V)
	7		VDD	SELV (24V)
CN10 SMW250-08	1	DHM	DHM Stepper Motor Coil / Y Phase	SELV (14V)
	2			
	3		DHM Stepper Motor Coil / X Phase	
	4			
	5		GND	
	6		DHM Stepper Motor Position	
	7		Unused	
	8		VDD	
CN14 SMW250-09	1	IWM	GND	
	2		IWM Stepper Motor Position	
	3		VDD	
	4		IWM Stepper Motor Coil X Phase	
	5		IWM Stepper Motor Coil Y Phase	
	6		VDD	
	7		IWM Stepper Motor Coil / X Phase	
	8		IWM Power IWM Stepper Motor Coil / Y Phase	
	9		Unused	-
CN3 SMW250-06	1	WPS	Unused	-
	2			
	3			
	4	FLUX1	VCC	SELV (5V)
	5		Water Flow Sensor	
	6		GND	
CN5 SMW250-10	1	RPM	Fan RPM Check	
	2		GND	

Table 19 – Water Heater Wiring 2

PART 10 – OPERATING SYSTEM INSTRUCTIONS

A. CONTROL PANEL

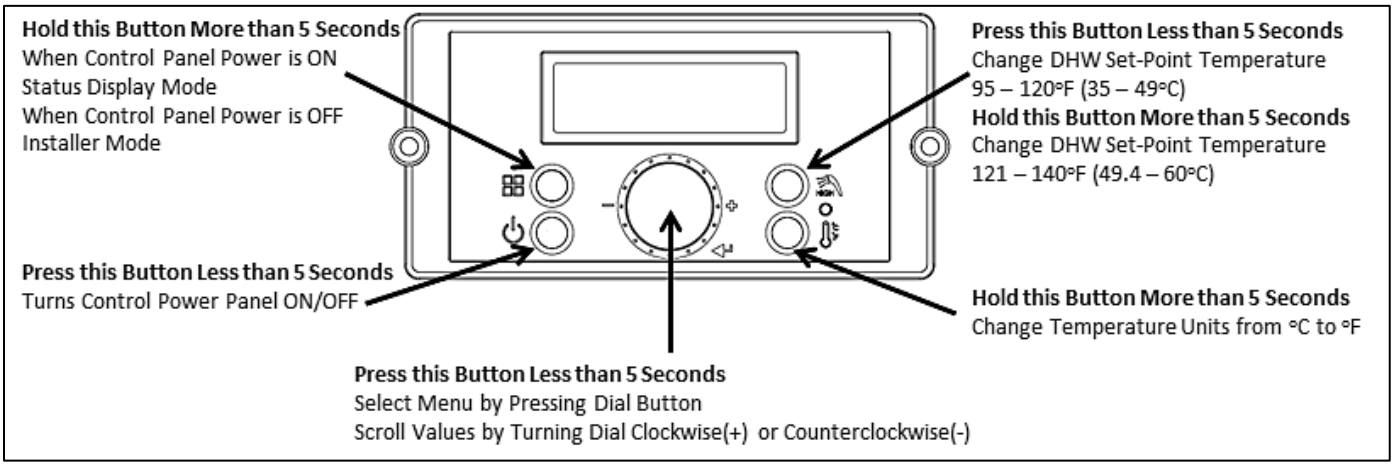

Hold this Button More than 5 Seconds
When Control Panel Power is ON
Status Display Mode
When Control Panel Power is OFF
Installer Mode
Press this Button Less than 5 Seconds
Change DHW Set-Point Temperature
95 – 120°F (35 – 49°C)
Hold this Button More than 5 Seconds
Change DHW Set-Point Temperature
121 – 140°F (49.4 – 60°C)
Press this Button Less than 5 Seconds
Turns Control Power Panel ON/OFF
Hold this Button More than 5 Seconds
Change Temperature Units from °C to °F
Press this Button Less than 5 Seconds
Select Menu by Pressing Dial Button
Scroll Values by Turning Dial Clockwise(+) or Counterclockwise(-)

Figure 23 – Water heater Control Panel Detail

B. LCD DISPLAY DESCRIPTIONS

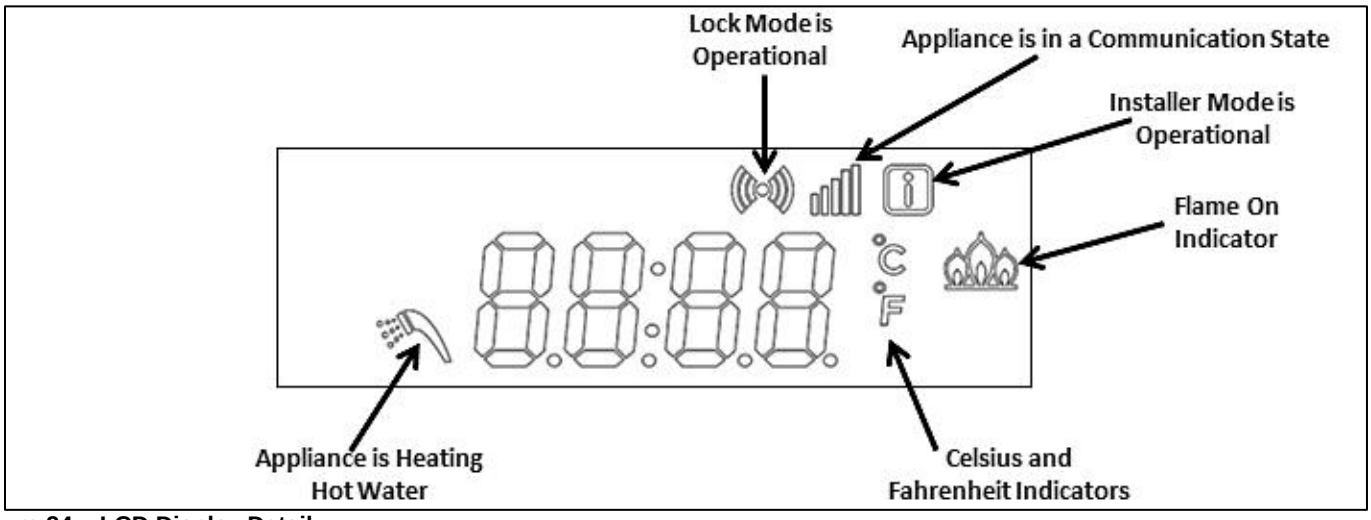


Figure 24 – LCD Display Detail

LCD also features a backlit lamp that will illuminate:

- When a user action is detected (a button is pressed)
- The display has timed out for approximately 2 minutes

C. START-UP SEQUENCE

After the appliance is powered ON, the LCD display shows a sequence of information. The icons will flash, followed by various indicators that describe the appliance controller and software versions. It will take the appliance roughly 15 seconds to cycle through the Start-Up Sequence.

After start-up, the display appears as follows.

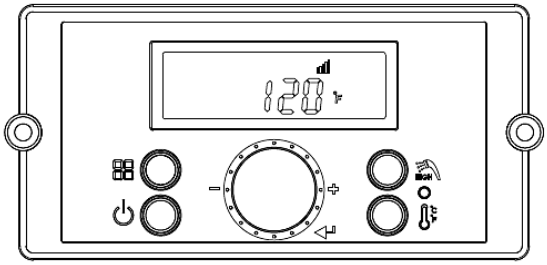


Figure 25 – Initial Display Screen

The Control System can operate through user and service modes that have specific LCD outputs and dedicated controls, including:

- Changing the Set-Point Temperature
- Error Mode
- Status Display Mode
- Installer Mode

NOTE: The Control System will not allow changes if Lock Mode is activated unless the B button is pressed for more than 5 seconds.

D. CHANGING THE DHW SET-POINT

The display shows the icon when the DHW set-point can be changed.

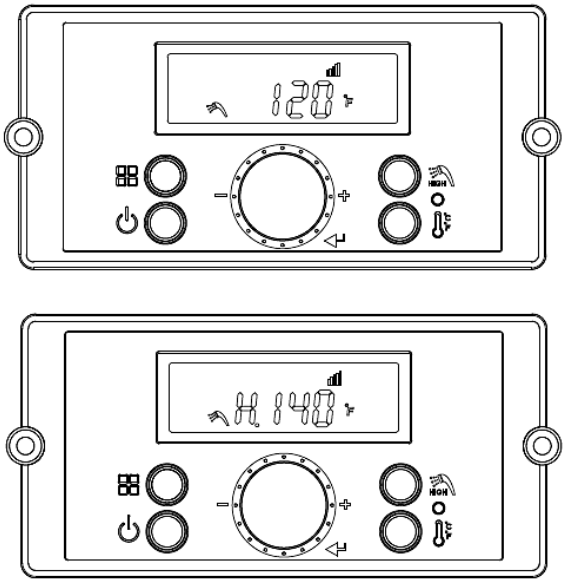


Figure 26 – DHW Set-Point Screens

Press the button when the display panel is powered ON to change the DHW Set-Point. The DHW icon and current set-point will display and flash. This indicates that the DHW Set-Point can be changed. Factory DHW Set-Point is 125°F (51°C). Initial DHW Set-Point range is 95 – 120°F (35 – 49°C).

Turn the dial counterclockwise to lower and clockwise to raise the DHW set-point. After changing the temperature, press the button to save the set-point.

To change the DHW Set-Point above 120°F (49°C), press and hold the button for five seconds when the display panel is powered ON. The current DHW set-point will display. The DHW icon will flash. And the scald warning letter “H” (high temperature) will display. High temperature DHW Set-Point range is 121 – 140°F (49.4 – 60°C).

Turn the dial counterclockwise to lower and clockwise to raise the DHW set-point. After changing the temperature, press the button to save the set-point.

⚠ DANGER

Hotter water increases the risk of scald injury. Scalding may occur within 5 seconds at a setting of 140°F (60°C). Water temperature over 125°F can instantly cause severe burns, or death, from scalds. Children, disabled, and elderly are at the highest risk of being scalded. See instruction manual before setting temperature at appliance. Feel water before bathing or showering!

E. CHANGING THE TEMPERATURE INDICATOR

To change the temperature indicator from Fahrenheit to Celsius, press and hold the Thermometer button for more than five seconds. This will toggle the temperature unit from the unit indicated on the display.

G. STATUS DISPLAY MODE

Status Display Mode will activate when button B is pressed and held for five seconds at Standby Mode.

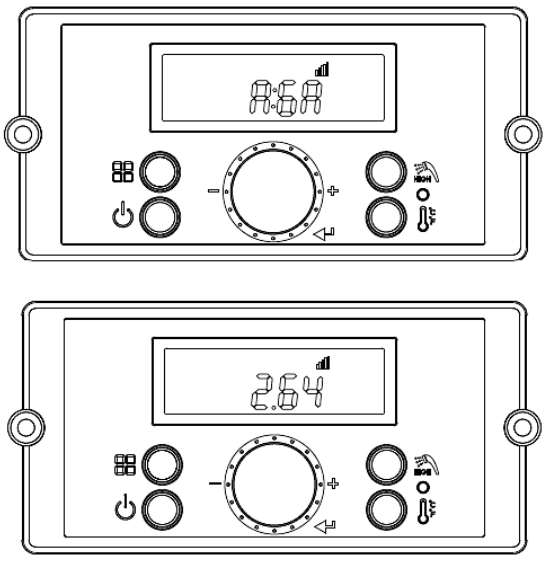


Figure 27 – Status Mode Screens

Parameter		Detail	Description
A: Li or A: GA		Flow 1	Current Flow Value (Li: Liters/min, GA: Gallons/min)
b: Fr		Fan rpm	Current Fan RPM Value
C: Lc		Lock Mode	Lock Mode is In Use (ON) or Unused (OFF) Allows user to lock out any temperature change.
d: oP		OP Temperature	Current Operating Temperature
E: dH		DHW Temperature	Current DHW Temperature
F: Eh		Exhaust Temperature	Current Exhaust Temperature
h: In		Inlet Temperature	Current Inlet Temperature
L:rt		Running Time	Display Running Time
L:rt	**1: PH**	Power Supply Time	Power Supply Time: 100 hour increments
	2: rh	Burner Operating Time	Burner Operating Time: 1 hour increments
	3: rH	Burner Operating Time	Burner Operating Time: 1,000 hour increments
	4: It	Ignition Attempts Number	Ignition Attempts Number: 10 times unit displayed
	5: IH	Ignition Attempts Number	Ignition Attempts Number: 10,000 times unit displayed
J: AG		N/A	N/A

Table 20 – Status Mode Display Screen Descriptions – NOTE: Shaded Parameters Not Used on This Software Version

Turn the dial counterclockwise and clockwise to scroll through the displayed parameters. To view parameter details, press the button at the appropriate screen. Press the or buttons to leave the parameter.

Press the button again to return to Operation Mode.

To turn on Lock Mode, press the button at the C:Lc parameter. Turn the dial counterclockwise and clockwise to scroll On or Off. Press the button to save the selection and return to the parameters.
Press the button again to return to Operation Mode.

NOTE: The Control System will not allow the changes if Lock Mode is activated. Lock Mode will have to be turned off before making further changes.

H. INSTALLER MODE

Installer Mode will activate when button B is pressed and held for five seconds while the water heater is powered Off.

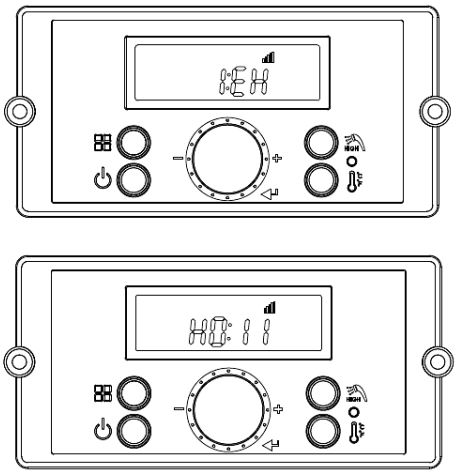


Figure 28 – Installer Mode Screens

Index	Default	Parameter	Description
1: EH	E0:00	History	Most Recent History Error Codes (H0 – H9)
2: cE	OFF	Clear Error History	Clears Error History
3: In	OFF	System Reset	Restores System to Default Settings (Burner operation time, Ignition cycles, and Supply power time will not be reset) Range: ON or OFF
4: Fu	GA	Flow Unit	Displays Flow Rate in Liters/Minute or Gallons/Minute Range: GA or Li
5: FH	00	N/A	N/A
6: FL	00	N/A	N/A
7: dr	NO	Reset Burner Operation Time	Reset Burner Operation Time
8: dI	NO	Reset Number of Ignition	Reset Number of Ignition
9: HA	-	N/A	N/A
10: Cn	00	N/A	N/A
11: CI	01	N/A	N/A
12: Eh	ON	N/A	N/A

Table 21 – Installer Mode Descriptions – NOTE: Shaded Parameters Not Used on This Software Version

Toggle through displayed items by turning the dial.
To change an item, press the Dial button.
Displayed items can be changed by turning the dial counterclockwise to lower, and clockwise to raise, the displayed value.
To save settings, press the Dial button again.

To leave Installer Mode, press button B again. The water heater will return to power off mode.

F. ERROR MODE

When the water heater encounters an error, the display will flash “Er” followed by a numerical code. The water heater shall enter a soft lockout condition if the error is such that it can return to normal operation once the condition relieves itself (overheat conditions, NTC open or shorts, etc.). The water heater shall enter a hard lockout if the condition indicates something more serious (flame, ignition, condensate line, etc.) To clear a hard lockout Error Code, press the Power button.

The following screen will display when the water heater encounters an error.

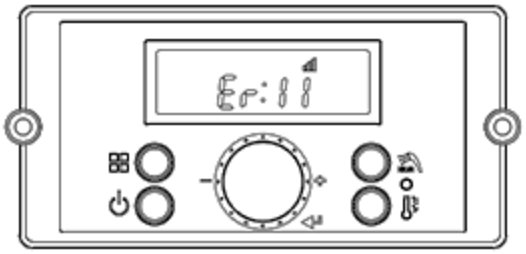


Figure 29 – Error Mode Screen

Error Code	Error Code Description	Possible Remedies
Er:10	Flame has Extinguished 8 (Eight) Times	Press the Power button to clear the Error Code. If Error happens again: 1. Monitor the gas pressure to the water heater while in operation. Ensure pressure is between 3.5 and 14" WC. 2. Check gas valve wire. Ensure connection is secure. 3. Check flame detection sensor. Ensure connections are secure. Normal operating settings are more than 2.5DC before ignition, less than 2.5DC after ignition. 4. Check vent terminations. Ensure there are no blockages. 5. Assure that the flame is stable when lit. 6. If the problem persists, replace the main control.
Er:11	Ignition has Failed 10 (Ten) Times	Press the Power button to clear the Error Code. If Error happens again: 1. Monitor the gas pressure to the water heater while in operation. Ensure pressure is between 3.5 and 14" WC. 2. Check gas valve wire. Ensure connection is secure. 3. Check flame detection sensor. Ensure connections are secure. Normal operating settings are more than 2.5DC before ignition, less than 2.5DC after ignition. 4. Check igniter transformer for proper connection. 5. Clean the spark igniter with steel wool to remove oxides. Ensure proper separation (3-4 mm). 6. Replace the spark igniter if damaged. 7. Assure that the flame is stable when lit. 8. If the problem persists, replace the main control.
Er:16	Operating Temperature Sensor or DHW Sensor detects Water Temperature Greater than 199°F (93°C)	This Error Code will go away when the DHW temperature decreases. If Error happens again: 1. Check if dip switch High Fire setting is ON. Switches 6 and 7 should be OFF for normal operation. 2. Check if DHW pipe is blocked. Ensure there is enough water flowing to the water heater. 3. Check DHW sensor at DHW outlet. If resistance is zero, replace the sensor. 4. Check Operating Temperature sensor at the heat exchanger. If resistance is zero, replace the sensor. 5. If the problem persists, replace the main control.
Er:20	High Limit Overheat Switch – Closed is Normal, Open is Fault	Press the Power button to clear the Error Code. 1. Inspect the High Limit Overheat switch. Ensure proper connections. 2. Check High Limit Overheat switch resistance. If resistance is zero, replace the switch. 3. If the problem persists, replace the main control.
Er:29	APS/Condensate – Closed is Normal, Open is Fault (Condensate Drain Trap)	Press the Power button to clear the Error Code. 1. Check APS/Condensate and main controller connections. Ensure all are secure. 2. Check APS/Condensate resistance. If resistance is zero, replace the switch. 3. Check APS/Condensate hose. Ensure it is connected and in good condition. 4. Check condensate line and termination for blockages. 5. Check exhaust vent for blockages. 6. If the problem persists, replace the main control.
Er:31	Inlet Water Sensor Open or Short	This Error Code will go away when inlet water temperature decreases. If Error happens again: 1. Check inlet water temperature sensor. Ensure connections are secure. 2. Check sensor resistance. If resistance is zero, replace the sensor. 3. If the problem persists, replace the main control.
Er:32	DHW Sensor Open or Short	This Error Code will go away when outlet water temperature decreases. If Error happens again: 1. Check DHW outlet temperature sensor. Ensure connections are secure. 2. Check sensor resistance. If resistance is zero, replace the sensor. 3. If the problem persists, replace the main control.
Er:33	Operating Temperature Sensor Open or Short	This Error Code will go away when outlet water temperature decreases. If Error happens again: 1. Check operating temperature sensor. Ensure connections are secure. 2. Check sensor resistance. If resistance is zero, replace the sensor. 3. If the problem persists, replace the main control.
Er:35	Exhaust Sensor Open or Short	This Error Code will go away when exhaust temperature decreases. If Error happens again: 1. Check exhaust temperature sensor. Ensure connections are secure. 2. Check sensor resistance. If resistance is zero, replace the sensor. 3. Check exhaust vent for blockage. 4. If the problem persists, replace the main control.
Er:38	Error Appears When Control Stores Data, but Data is not Saved	Press the Power button to clear the Error Code. Replace the main control.
Er:39	Flame Detected after Exiting a Flame On Condition	This Error Code will go away when the false flame condition is remedied. If Error happens again: 1. Check the water heater cover. Ensure it is secure. Flame detection sensor can detect an external light source. 2. Check flame detection sensor. Ensure connections are secure. Normal operating settings are more than 2.5DC before ignition, less than 2.5DC after ignition. 3. If the problem persists, replace the main control.

Error Code	Error Code Description	Possible Remedies
Er:40	Gas Leakage is Detected in 10 Minutes, or three times within One Hour (Greater than 5 Seconds Each Time)	**IMPORTANT:** If you smell gas, STOP! Follow the instructions on page 2, this manual, and call a qualified service technician or the fuel gas utility. Press the Power button to clear the Error Code. If Error happens again: 1. Check the water heater cover. Ensure it is secure. 2. Check gas connections for leakage with a soapy solution. Fix any leaks. 3. Check condition of the burner assembly. 4. If the problem persists, replace the main control.
Er:41	Fan Speed too High with Flame On	Press the Power button to clear the Error Code. If Error happens again: 1. Check the vent connections for blockages. 2. Check the burner assembly. 3. Check fan operation. If fan appears to be operating normally but RPMs are too low or too high, replace the fan. 4. If the problem persists, replace the main control.
Er:42	Jumped Wire Disconnected	Press the Power button to clear the Error Code. If Error happens again: 1. Ensure the jumped wire is properly connected. 2. If the problem persists, replace the main control.
Er:43	Burner Overheat Switch Open	Press the Power button to clear the Error Code. If Error happens again: 1. Check burner overheat switch connections. Ensure connections are secure. 2. Check switch resistance. If resistance is zero, replace the switch. 3. If the problem persists, replace the main control.
Er:61	Fan Speed Feedback Signal Abnormal	This Error Code will go away when the condition is remedied. If Error happens again: 1. Check the connections to the fan. Ensure all are secure. 2. If the fan does not rotate during the ignition sequence, check for 120V power at the fan connection. If 120V power is present at the control, replace the fan. If the blower does not have 120V power, check power at the control. If 120V power is not present at the control, replace the control. 3. If the problem persists, replace the main control.
Er:65	Supply Water Valve Error	Press the Power button to clear the Error Code. If Error happens again: 1. Turn power OFF and ON at the main power switch internal to the water heater. 2. Check wiring connections to supply water valve. Ensure all are secure. 3. Replace supply water valve. 4. If the problem persists, replace the main control.
Er:66	Mixing Valve Error	Press the Power button to clear the Error Code. If Error happens again: 1. Turn power OFF and ON at the main power switch internal to the water heater. 2. Check wiring connections to mixing valve. Ensure all are secure. 3. Replace mixing valve. 4. If the problem persists, replace the main control.
Er:67	AGM Error	Press the Power button to clear the Error Code. If Error happens again: 1. Turn power OFF and ON at the main power switch internal to the water heater. 2. Ensure fan inlet hole is completely open after turning the power OFF and ON. 3. Check wiring connections to the AGM. Ensure all are secure. 4. Check AGM operation. 5. Replace AGM components. 6. If the problem persists, replace the main control.
Er:70	Register, Ram, Rom, I/O Port, AD Abnormal, Important EPROM Data or Safe Data Abnormal	This Error Code will go away when the condition is remedied. If Error happens again: 1. Turn power OFF and ON at the main power switch internal to the water heater. 2. If the problem persists, replace the main control.
Er:72	Flame Signal Detected before Ignition	This Error Code will go away when the condition is remedied. If Error happens again: 1. Check the water heater cover. Ensure it is secure. Flame detection sensor can detect an external light source. 2. Check flame detection sensor. Ensure connections are secure. Normal operating settings are more than 2.5DC before ignition, less than 2.5DC after ignition. 3. If the problem persists, replace the main control.
Er:73	DIP Switch is abnormal	This Error Code will go away when the condition is remedied. If Error happens again: 1. Check dip switches. Ensure switches match the ratings plate requirements of the water heater. See dip switch details, this manual, for default settings. 2. If the problem persists, replace the main control.
Er:76	Poor Communication	This Error Code will go away when the condition is remedied. If Error happens again: 1. Check connections from main control to display panel. 2. If the problem persists, replace the display and/or the main control.

Error Code	Error Code Description	Possible Remedies
Er:94	Exhaust NTC detects Vent Temperature is Greater than 149°F (65°C)	This Error Code will go away when the condition is remedied. If Error happens again: 1. Check if dip switch High Fire setting is ON. Switches 6 and 7 should be OFF for normal operation. 2. Check exhaust temperature sensor. Ensure connections are secure. 3. Check sensor resistance. If resistance is zero, replace the sensor. 4. Check exhaust vent for blockage. 5. If the problem persists, replace the control. 6. If the problem persists, replace the heat exchanger.

Table 22 –Diagnostics and Suggested Corrective Actions

⚠ WARNING

This water heater is equipped with a blocked vent shutoff system. If Error Codes Er:29, Er:41, or Er:94 occur, turn off the gas valve at the manual shutoff. Check the vent terminations for obstructions. If no obstructions are found, reset the water heater by pressing the power button. If the error continues to occur, call a qualified service technician or the gas supplier to check the water heater. Failure to follow these instructions could result in property damage, personal injury, or death.

G. ERROR TREE ANALYSIS

1. FLAME DETECTION

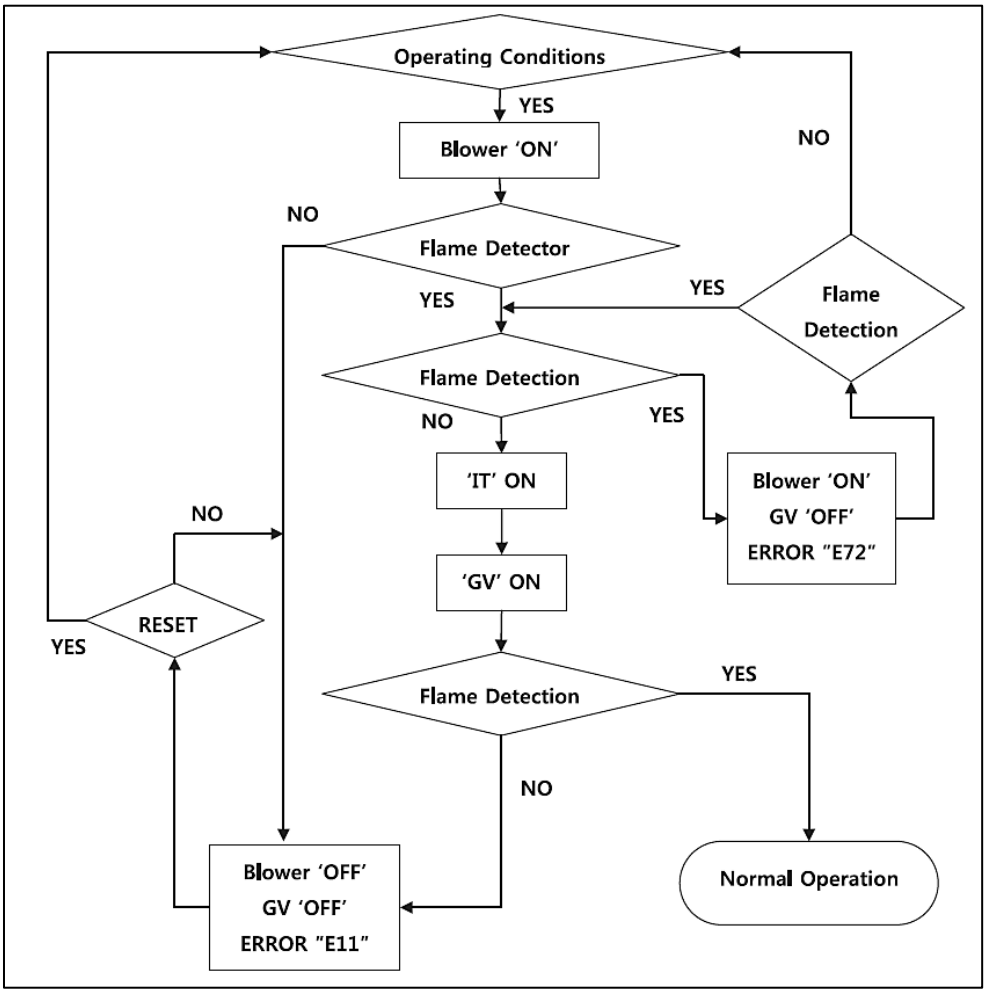


Figure 30 – Flame Detection Error Analysis Tree

2. GAS DETECTION

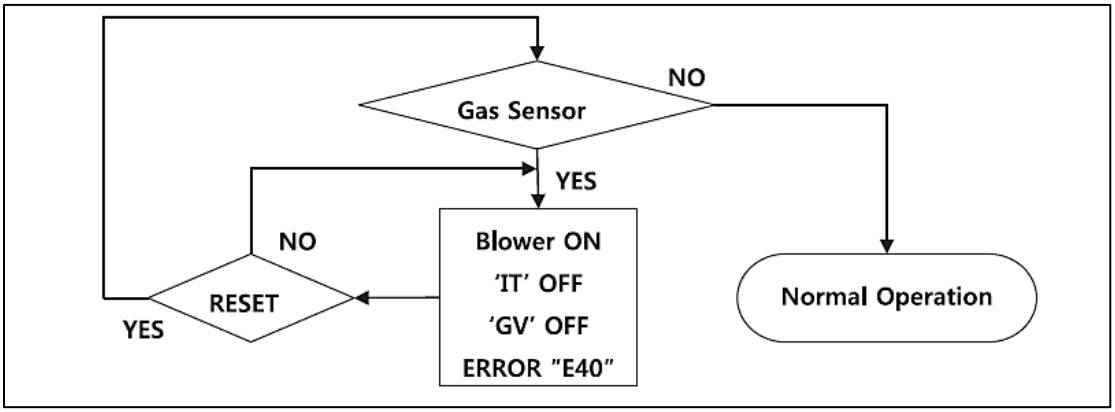


Figure 31 – Gas Detection Error Analysis Tree

3. AIR PRESSURE SWITCH

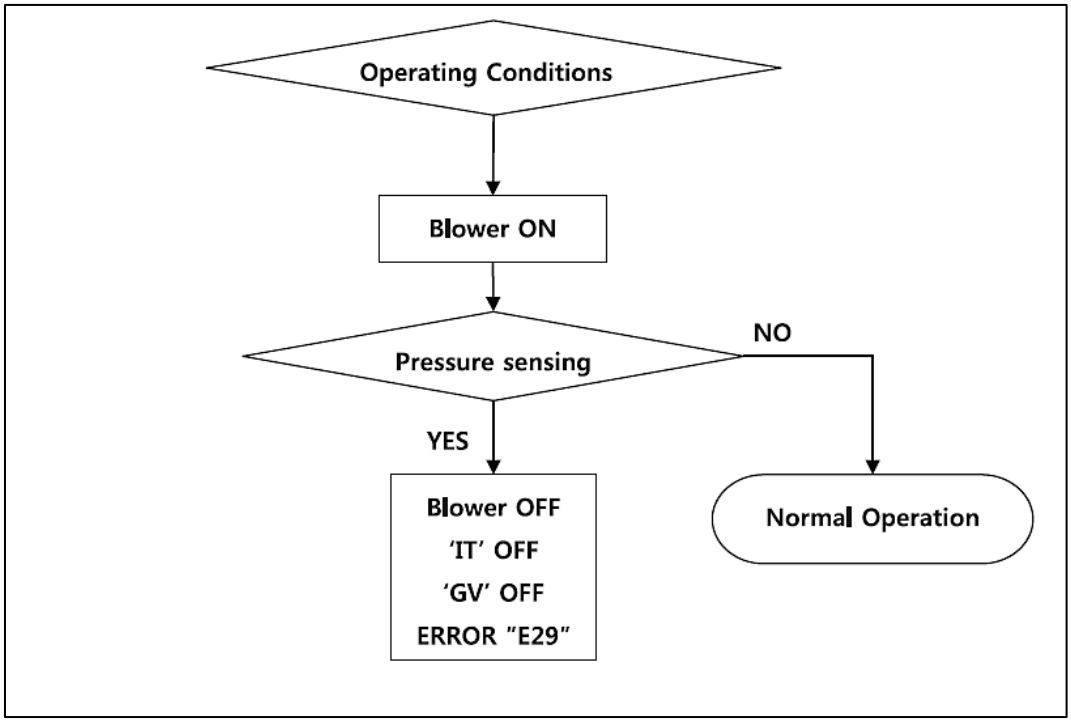


Figure 32 – Air Pressure Switch Analysis Tree

4. Inlet / DHW / Operating Temperature SENSORS

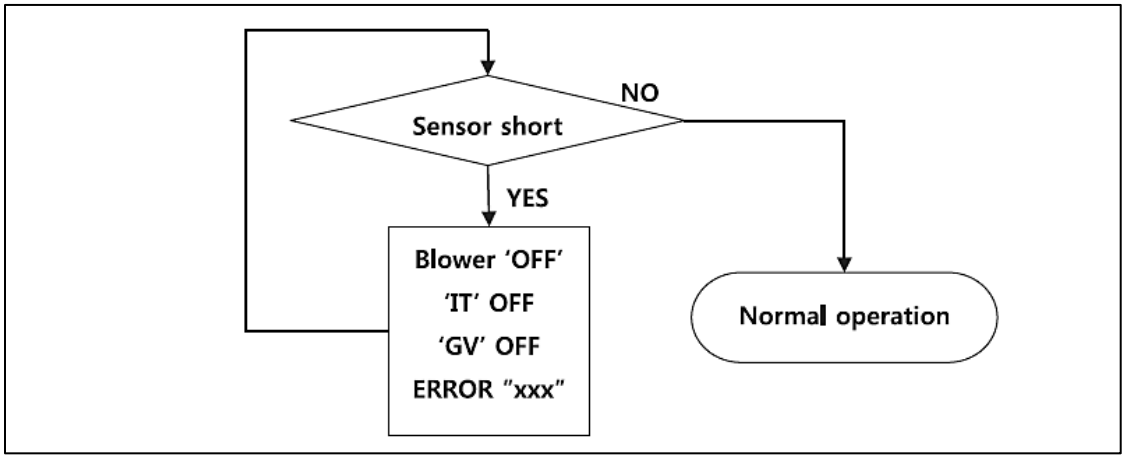


Figure 33 – Inlet / DHW / Operating Temperature Sensors Error Analysis Tree

PART 11 – FINAL INSTALLATION CHECKLIST

		YES	NO
BEFORE INSTALLING	Is there enough space to ensure proper installation?		
	Does installation location allow for proper service clearances?		
	Are water and gas lines properly sized and set at proper pressures for the installation?		
	Is water heater location as near the exhaust vent / intake pipe terminations as possible?		
	Have combustible materials been cleared from the installation location?		
	Is there a drain close to the water heater?		
INSTALL WATER PIPING	Does water heater loop piping meet the minimum sizing requirements listed? **NOTE:** Smaller piping will cause performance problems.		
	Has water chemistry been checked?		
	Does water chemistry meet requirements?		
	If water chemistry does not meet requirements, have treatment measures been put in place?		
	Has the system been cleaned and flushed?		
INSTALL EXHAUST VENT AND INTAKE PIPING	Has the water heater been vented with the approved materials listed in this manual (3" PVC, CPVC, Polypropylene, etc.) or to meet local codes?		
	Is air supply sufficient for proper water heater operation?		
	Is total vent piping length within the maximum vent length restriction listed in this manual?		
	Have venting lengths been minimized?		
	Are terminations properly spaced from windows, doors, and other intake vents?		
	Have all vent terminations been installed at least one foot above exterior grade and one foot above normal snow accumulation level?		
	Is vent piping properly supported?		
	Has vent piping been checked for leaks?		
	Has the exhaust vent line been pitched back to the water heater at a rate of ¼" per foot?		
	Have the exhaust vent and intake pipes been properly installed into the connectors provided on the water heater?		
INSTALL CONDENSATE PIPING / TUBING AND COMPONENTS	Have all condensate line components included with the water heater been installed?		
	Is the condensate line piped with the approved materials listed in this manual?		
	Has the condensate line been routed to a laundry tub or other drain?		
INSTALL GAS PIPING	Is the gas supply line a minimum of ¾" in diameter?		
	Is the gas supply line length and diameter adequate to deliver the required BTUs?		
	Has gas supply line pressure been measured?		
	Does the gas type match the type indicated on the water heater rating plate?		
	Has a union and shut-off valve been installed?		
PRESSURE RELIEF VALVES	Have you installed approved pressure relief valves on the hot water outlet near the water heater?		
	Is the pressure relief valve in the DHW line at least ¾" in diameter?		
WIRE THE WATER HEATER	Connect the power and control wiring per water heater wiring diagram, this manual.		
	Have all DIP switches been set on the main water heater board?		
	Is electrical connection polarity within water heater requirements?		
	Do power specifications meet water heater requirements? 120V AC?		
START-UP, ADJUST, AND TEST	Has the water heater been started?		
	If necessary, has the water heater gas valve been adjusted?		
	Has the installation been customized per installation location requirements?		
	Have all customized system parameters been tested?		
	Has proper water heater operation been confirmed?		
BURNER FLAME	Has the burner flame been checked?		
	Is the burner flame a proper blue color?		
	If the flame does not appear normal, it may need to be cleaned by a qualified service technician. See Figure 34 for flame sight glass window location.		
FINAL INSTALLATION APPROVALS	**SIGNED BY TECHNICIAN**	**DATE**	

Table 23 – Final Installation Checklist

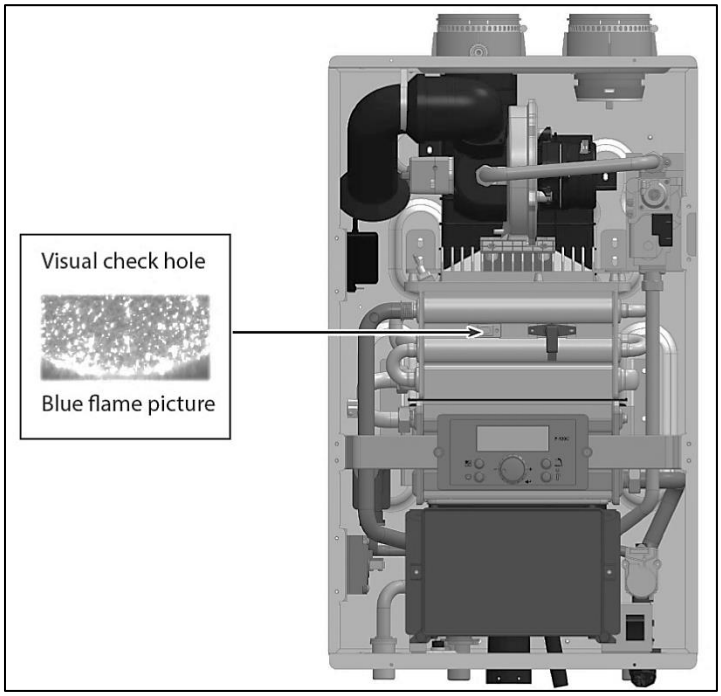


Figure 34 – Flame Sight Glass

PART 12 – TROUBLESHOOTING

TROUBLESHOOTING CHART		
PROBLEM	**POSSIBLE CAUSES**	**POSSIBLE REMEDIES**
No electrical power to the water heater	1. Is the plug on the power supply cord unplugged from the electrical outlet? 2. Is electrical panel's 10 Amp circuit breaker tripped? 3. Is the fuse on the circuit board good? 4. Is there a power outage to the home?	1. Reset the plug. 2. Reset the circuit breaker. 3. If the display panel is blank, unplug the unit or contact an authorized service technician. 4. Contact the power company.
No water available when a faucet is opened	1. Is the water supply valve shut off at the meter (do cold water faucets work)? 2. Is the water supply valve near the unit open? 3. Is the water pipe frozen? 4. Is an error code flashing on the display panel (leak detected)?	1. Open the closed supply valve. 2. Open the water supply valve. 3. Turn OFF the unit, close all water valves and the gas valve. Contact an authorized service technician. 4. Refer to error code information and contact an authorized service technician.
Hot water is not available when the faucet is opened.	1. Does the water heater have power (plugged in)? 2. Is the water heater turned ON? 3. Is an error code flashing on the display panel? 4. Is the gas supply valve open or shut off at the meter (do other gas devices work)?	1. Restore electrical power to the unit. 2. Press and hold the **Power** button to turn the unit ON. 3. Refer to the Diagnostic and Error Codes section in this manual. 4. Open the gas supply valve.
The water temperature is not hot enough or turns cold during use.	1. Is the faucet open enough to draw at least 0.6 gallons (2.3L) per minute through the water heater? 2. Is an error code flashing on the display panel? 3. Is the outlet water temperature set too low?	1. Open the faucet to allow more water flow. 2. Refer to the Diagnostic and Error Codes section in this manual. 3. Adjust the outlet water temperature (refer to the procedure in this manual).
It takes a long time before hot water flows from the faucet.	Is the faucet some distance from the water heater?	a. Allow time for the cold water already in the pipes to flow from the faucet. b. Have recirculation valves and/or plumbing return line(s) installed and program the unit for recirculation mode.
The water is not hot enough.	Is the water temperature set too low?	Adjust the temperature setting.
The water at the faucet is too hot.	Is the water temperature set too high?	Adjust the temperature setting.
A fan can be heard even when the unit is not operating.	1. The fan continues to operate after the burner shuts off to clear the exhaust vent of combustion gases. 2. The fan may run to help prevent freezing.	1. This is normal operation – no action is required. 2. Protect the water heater from freezing temperatures or shut off and drain the unit.

PROBLEM	POSSIBLE CAUSES	POSSIBLE REMEDIES
White “smoke” can be seen coming out of the exterior exhaust gas vent.	Depending on the outside temperature, water vapor can be produced as the exhaust is vented.	This is normal operation – no action is required.

Table 24 – Troubleshooting Chart

DIAGNOSTICS AND SUGGESTED CORRECTIVE ACTIONS
The water heater control is able to record information about the water heater’s condition at the time of the ten previous faults or errors. This information is available to view in the Installer Mode under the History screen.

The following screens may be displayed when reviewing the water heater history. The table below also includes diagnostic information and possible corrective actions.

Display	Condition	Diagnostic	Possible Corrective Actions
Nothing appears on the display control panel but the fan runs at full speed	Control is not receiving power	Check wiring for short circuit or incorrect wiring	Correct wiring per wiring diagram including connection of transformer to the control
		Check transformer connection to the control per wiring diagram. Check for 14V output of panel wire	Push the Power button on the control panel
Nothing appears on the display control panel and no other water heater components are operating	Control is not receiving 120V power	Ensure service switch and/or circuit breaker to water heater is turned ON	Turn on service switch or circuit breaker to power water heater
		Is there 120V at the service switch	Troubleshoot and correct the power supply to the manual switch
		Is the ON/OFF switch inside the water heater cabinet is turned on	Turn ON the manual power switch inside the water heater cabinet
		Check for 120V at the line voltage terminal block located inside the water heater cabinet	Correct wiring inside the water heater cabinet using the wiring diagram in the installation manual
		Inspect the fuse. Replace as necessary	Replace the fuse with the proper part found in the replacement part section of this manual. If fuse blows again, recheck the wiring per diagram
Nothing appears on the display control panel, but the water heater is operating	Occurs when communications is lost from the control to the display	Check for loose connections and proper pin alignment / engagement on the control’s plug	Check for continuity on the wire harness from the display to the control. See repair parts section for proper replacement part.
		Cycle power off and on using water heater power switch and check for operation	Replace with new display module. See repair parts section for proper replacement part.

Table 25 –Diagnostics and Suggested Corrective Actions

PART 13 – MAINTENANCE PROCEDURES

⚠ DANGER

The water heater must be inspected and serviced annually, preferably at the start of the heating season, by a qualified service technician. In addition, the maintenance and care of the water heater as outlined in this manual must be performed by the user/owner to assure maximum efficiency and reliability. Follow the maintenance procedures given throughout this manual. Failure to perform the service and maintenance or follow the directions in this manual could damage the water heater or system components, resulting in substantial property damage, severe personal injury, or death.

Check the Surrounding Area

⚠ DANGER

To prevent the potential of substantial property damage, severe personal injury, or death, eliminate all the materials listed in **Error! eference source not found.** from the area surrounding the water heater and the vicinity of the combustion air intake. If contaminates are found:

- Remove products immediately from area.
- If contaminates have been there for an extended period, call a qualified service technician to inspect the water heater for possible damage from acid corrosion.

If products cannot be removed, immediately call a qualified service technician to re-pipe the combustion air intake piping away from the contaminated areas.

Combustible/Flammable Materials
Do not store combustible materials, gasoline, or other flammable vapors or liquids near the water heater. If found, remove these materials immediately.

Air Contaminates
If allowed to contaminate combustion air, products containing chlorine or fluorine will produce acidic condensate that will cause significant damage to the water heater. Read the list of potential contaminates and areas likely to have these contaminates in **Error! eference source not found.**, Part 2. If any of these contaminates are in the room where the water heater is located, or combustion air is taken from one of the areas listed, the contaminates must be removed immediately or the intake pipe must be relocated to another area.

Ensure the Water Heater Cabinet is Closed
Ensure the water heater cabinet is closed. Tighten the two upper and lower screws to secure it. The cabinet must be closed while the water heater is running.

Check the Power Source
Make sure the power cord is properly connected. The main power line is connected to the manual switch box inside the water heater.

Check the Status of the Control Panel
Observe the Control Panel to ensure the water heater is powered on, and to check for any error codes. Clear any debris from the panel.

Check Exhaust Vent and Intake Pipe Terminations
Verify that the water heater exhaust vent and intake pipe terminations are clean and free of obstructions. Remove any debris from the exhaust vent or intake pipe openings. If removing the debris does not allow the water heater to operate correctly, contact your qualified service technician to inspect the water heater and the vent system.

Check Exhaust Vent and Intake Piping
Visually inspect the exhaust vent for any signs of blockage, leakage, or deterioration of the piping. Inspect the exhaust vent bracing. Ensure bracing is undamaged and in good condition. Notify a qualified service technician immediately if any problems are found.

⚠ WARNING

Failure to inspect the venting system and have it repaired by a qualified service technician can result in vent system failure, causing severe personal injury or death.

Visually inspect the intake piping for any signs of blockage. Inspect the entire length of the intake pipe to ensure piping is intact and all joints are properly sealed. Inspect the intake pipe bracing. Ensure bracing is undamaged and in good condition. Notify a qualified service technician if any problems are found.

Check Pressure Relief Valve

- Visually inspect the primary pressure relief valve and discharge pipe for signs of weeping or leakage.
- If the pressure relief valve often weeps, the expansion tank may not be operating properly. Immediately contact a qualified service technician to inspect the water heater and system.

Check the Condensate Drain System

- While the water heater is running, check the discharge end of the condensate drain tubing. Ensure no flue gas is leaking from the condensate drain tubing by holding your fingers near the opening.
- If you notice flue gas leaking from the opening, this indicates a dry condensate drain trap. If problem persists, contact a qualified service technician to inspect the water heater and condensate line and refill the condensate trap.
- If applicable, check the condensate neutralizer and ensure it is full of condensate neutralizing marble chips.

Cleaning the Air Intake Filter
The air intake filter should be cleaned once a month. If not, the water heater could encounter combustion problems.

To clean the air intake filter:
1. Press the Power button on the control panel to turn off the water heater.
2. Disconnect the power supply from the water heater.
3. If water heater has been operating, wait for it to cool before continuing.
4. Remove the front cover of the water heater cabinet.
5. Pull the filter out of the air intake adapter.
6. Remove the filter from the plastic assembly and clean it with a toothbrush and clean running water. See Figure 35.

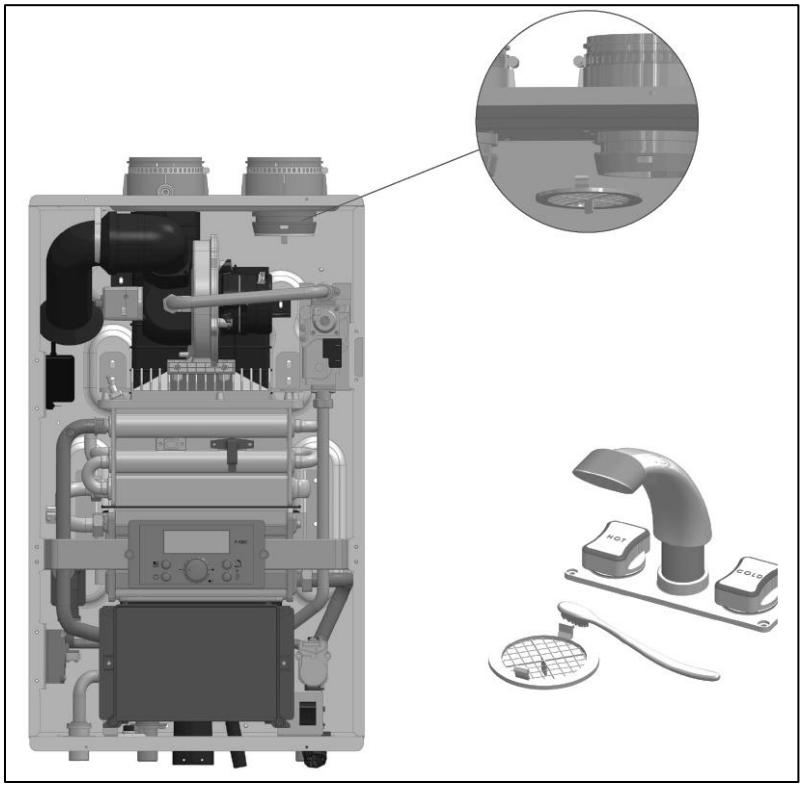


Figure 35 – Cleaning the Air Intake Filter

7. Dry the filter completely. Then reinsert the filter into the plastic assembly.
8. Replace the front cover of the water heater cabinet. Reconnect power supply to the water heater.
9. Press the Power button on the control panel to turn on the water heater.

Check Primary and Gas Piping

- Remove the water heater cover and perform a gas leak inspection following Operating Instructions, page 2, this manual. If gas odor or leak is detected, follow procedures on page 2. Call a qualified service technician.
- Visually inspect for leaks around the internal water heater water connections and around the heat exchanger. Visually inspect the external system piping, circulators, and system components and fittings. Immediately call a qualified service technician to repair any leaks

⚠ WARNING

Have leaks fixed at once by a qualified service technician. Failure to comply could result in substantial property damage, severe personal injury, or death.

Operate Pressure Relief Valve

- Before proceeding, verify that the relief valve outlet has been piped to a safe place of discharge, avoiding any possibility of scalding from hot water.
- Shut power off to the water heater. To avoid scalding, wait for water heater to cool before operating the relief valve.

⚠ WARNING

To avoid water damage or scalding due to relief valve operation, a discharge line must be connected to the valve outlet and directed to a safe place of disposal. This discharge line must be installed by a qualified service technician or heating/plumbing installer in accordance with the water heater installation manual. The discharge line must be terminated so as to eliminate possibility of severe burns or property damage should the valve discharge.

- List the relief valve lever. If water flows freely, release the lever and allow the valve to seat. Watch the end of the relief valve discharge pipe to ensure that the valve does not weep after the line has had time to drain. If the valve weeps, lift the lever again to attempt to clean the valve seat. If the valve does not properly seat and continues to weep, contact a qualified service technician to inspect the valve and system.
- If water does not flow from the valve when you completely lift the lever, the valve or discharge line may be blocked. Immediately shut the water heater down per instructions on page 2 and call a qualified service technician to inspect the valve and system.

- If relief valve seats properly, restore power to the water heater. Observe operation for five minutes and ensure it operates properly.

Check the Burner
Clean the exterior of the burner.

Cleaning the Cold Water Inlet Filter (Draining the Water Heater)
1. Place a bucket under the appliance to collect the residual water inside the water heater.
2. Press the Power button on the control panel to turn off the electrical power to the water heater. Then turn off the gas valve.
3. Valve off the water heater from the system. If the water heater cannot be isolated from the system, turn off the main water valve. Open the hot water faucets in the system to aid in draining the system.
5. Remove the cold water inlet filter. Then clean it with a toothbrush and clean running water. See Figure 36.

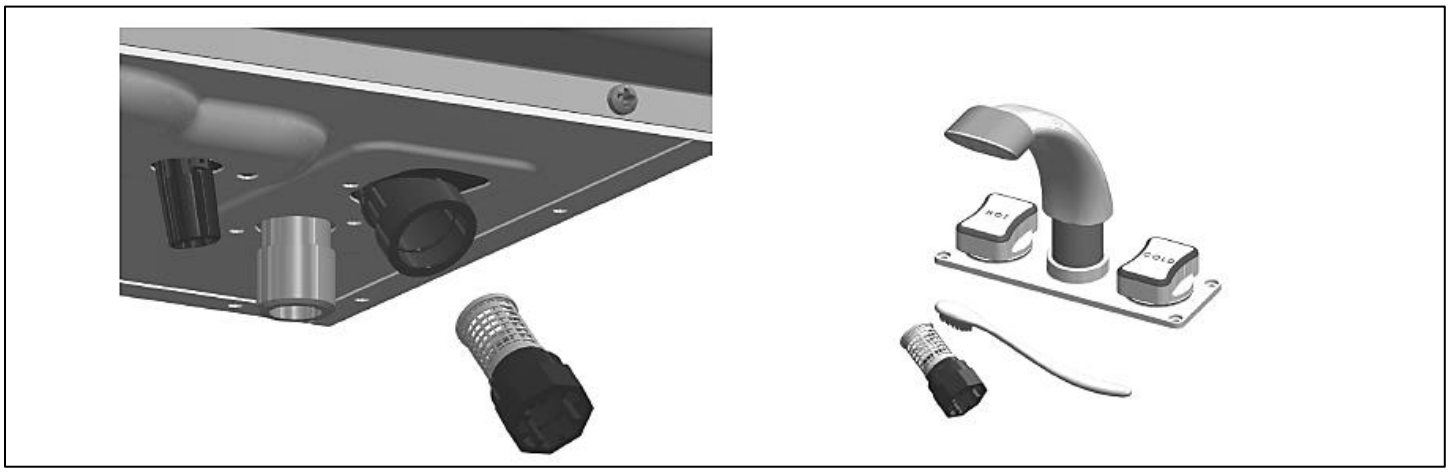


Figure 36 – Draining the Water Heater

6. Reinstall the cold water inlet filter.
7. Restore water service to the water heater by opening the isolation valves, or turning on the main water valve.
8. Turn on the gas valve. Turn on electrical power to the water heater and press the Power button to turn the water heater on.

Flushing the Water Heater
Flushing the heat exchanger is a complicated procedure that should only be performed by a qualified service technician.

NOTE: Improper maintenance WILL VOID water heater warranty.

1. Disconnect electrical power to the water heater.

2. Close the shutoff valves on both hot water outlet and cold water inlet lines (V1 and V2). See Figure 37.

3. Connect one hose (D1, Figure 37) to the valve (V3) and place the free end in a bucket. Connect one of the hoses (D3) to the circulation pump outlet and the cold water inlet line to valve V4. Connect the other hose (D2) to the circulation pump inlet and place the free end in the bucket.

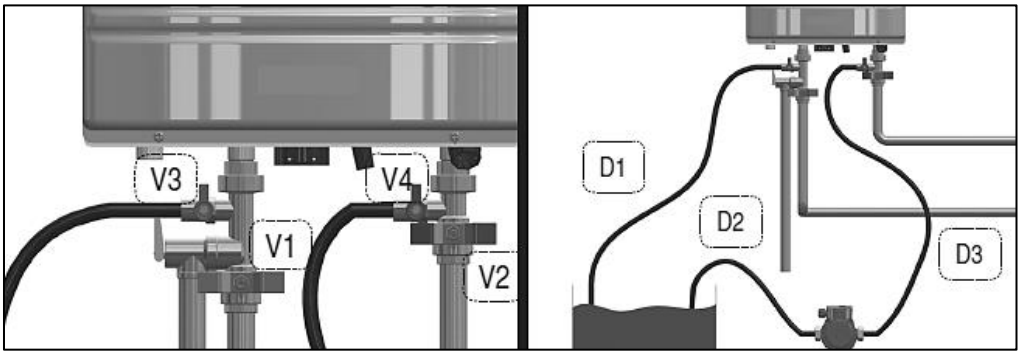


Figure 37 – Flushing the Water Heater

4. Pour tankless water heater cleaning solution into the bucket. Ensure the cleaning solution is approved for potable water systems. Place the drain hose (D1) and hose D2 to the pump inlet in the cleaning solution.

5. Open service valves (V3 and V4) on the hot water outlet and cold water inlet lines.

6. Turn on the circulation pump. Operate the pump and allow the cleaning solution to circulate through the water heater for at least 1 hour at a rate of 4 gallons per minute. This will remove any possible harmful scale deposits.

7. Rinse the cleaning solution from the combination water heater as follows:
   a. Remove the free end of drain hose D1 from the bucket.
   b. Close service valve V4 and open shutoff valve V2.
   c. Do not open shutoff valve V1.
   d. Allow water to flow through the water heater for 5 minutes.
   e. Close shutoff valve V2.

8. Disconnect all hoses.

9. Remove the cold water inlet filter from the water heater and clean out any residues.

10. Reinsert the filter and ensure the filter cap is securely tightened.

11. Connect electrical power to the water heater.

12. Open a hot water faucet. Run the water heater continuously for five minutes to ensure all cleaning solution is purged from the system. Check for leaks and ensure the water heater is operating properly.

REPLACEMENT PARTS

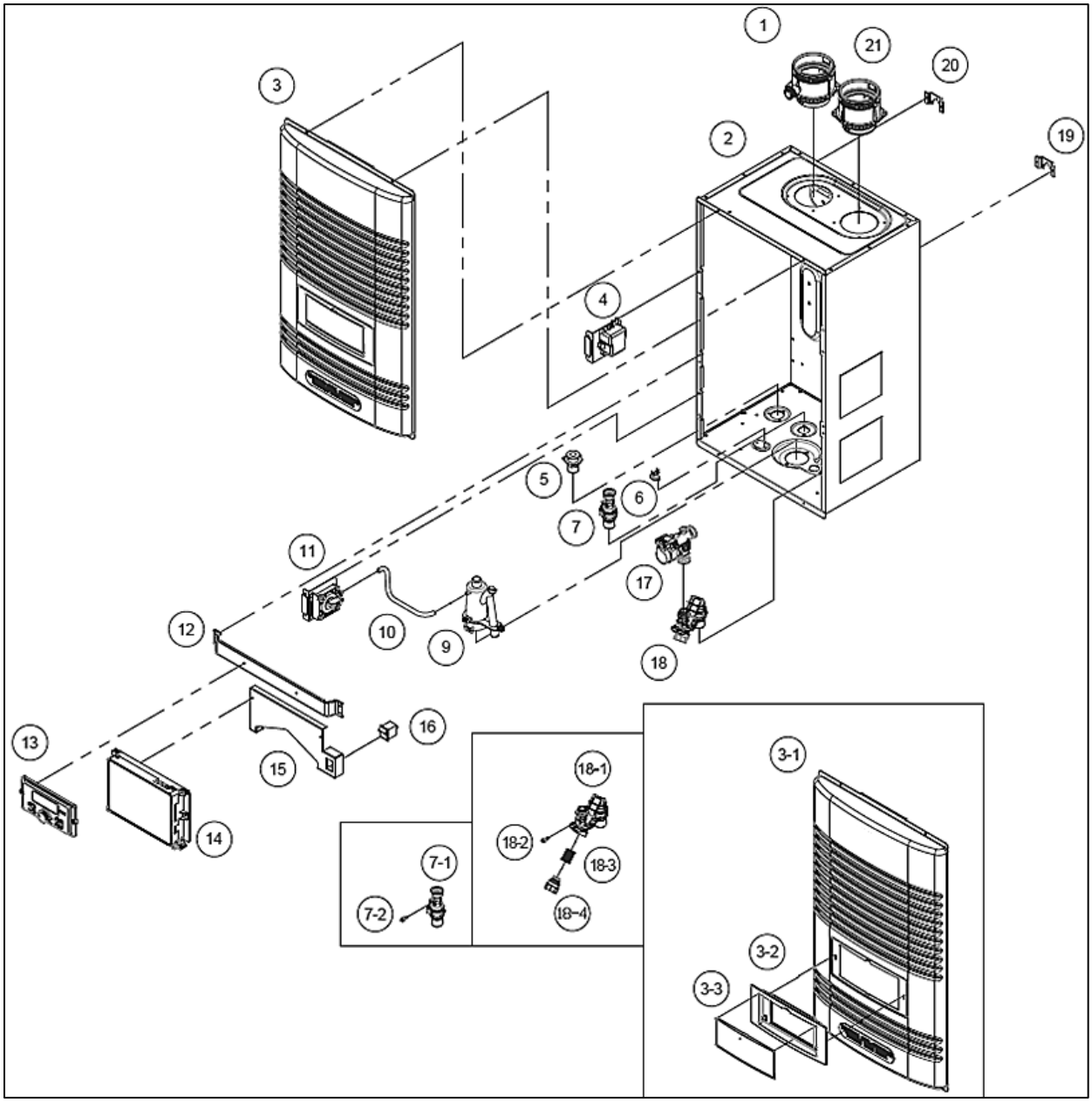


Figure 38 – Cabinet Replacement Parts

NUMBER	DESCRIPTION	PART NUMBER	NUMBER	DESCRIPTION	PART NUMBER
1	EXHAUST ASSY	7850P-021	11	AIR PRESSURE SWITCH	7850P-047
2	CASE	7850P-044	12	DISPLAY BRACKET	7850P-065
3	DOOR ASSY	7850P-025	13	DISPLAY	7850P-057
3-1	FRONT COVER	7850P-062	14	CONTROL	7850P-058
3-2	DISPLAY PANEL BRACKET	7850P-024	15	CONTROL BRACKET	7850P-066
3-3	DISPLAY PANEL	7850P-023	16	ROCKER SWITCH	7850P-059
4	IGNITION TRANSFORMER	7850P-045	17	FLOW CONTROL VALVE	7850P-053
5	GAS INLET NIPPLE	7850P-043	18	WATER INLET VALVE ASSY	7850P-018
6	OVERHEAT SENSOR	7850P-050	18-1	WATER INLET VALVE BODY	7850P-067
7	DHW SUPPLY PIPE ASSY	7850P-020	18-2	WATER INLET SENSOR	7850P-015
7-1	DHW SUPPLY PIPE	7850P-063	18-3	WATER INLET FILTER	7850P-017
7-2	WATER OUTLET SENSOR	7850P-019	18-4	WATER INLET FILTER CAP	7850P-016
8	N/A	N/A	19	CASE BRACKET (LEFT)	7850P-068
9	SIPHON ASSY	7850P-014	20	CASE BRACKET (RIGHT)	7850P-069
10	SIPHON AIR PRESSURE HOSE	7850P-064	21	INTAKE AIR ASSY	7850P-022

Table 26 – Cabinet Replacement Parts

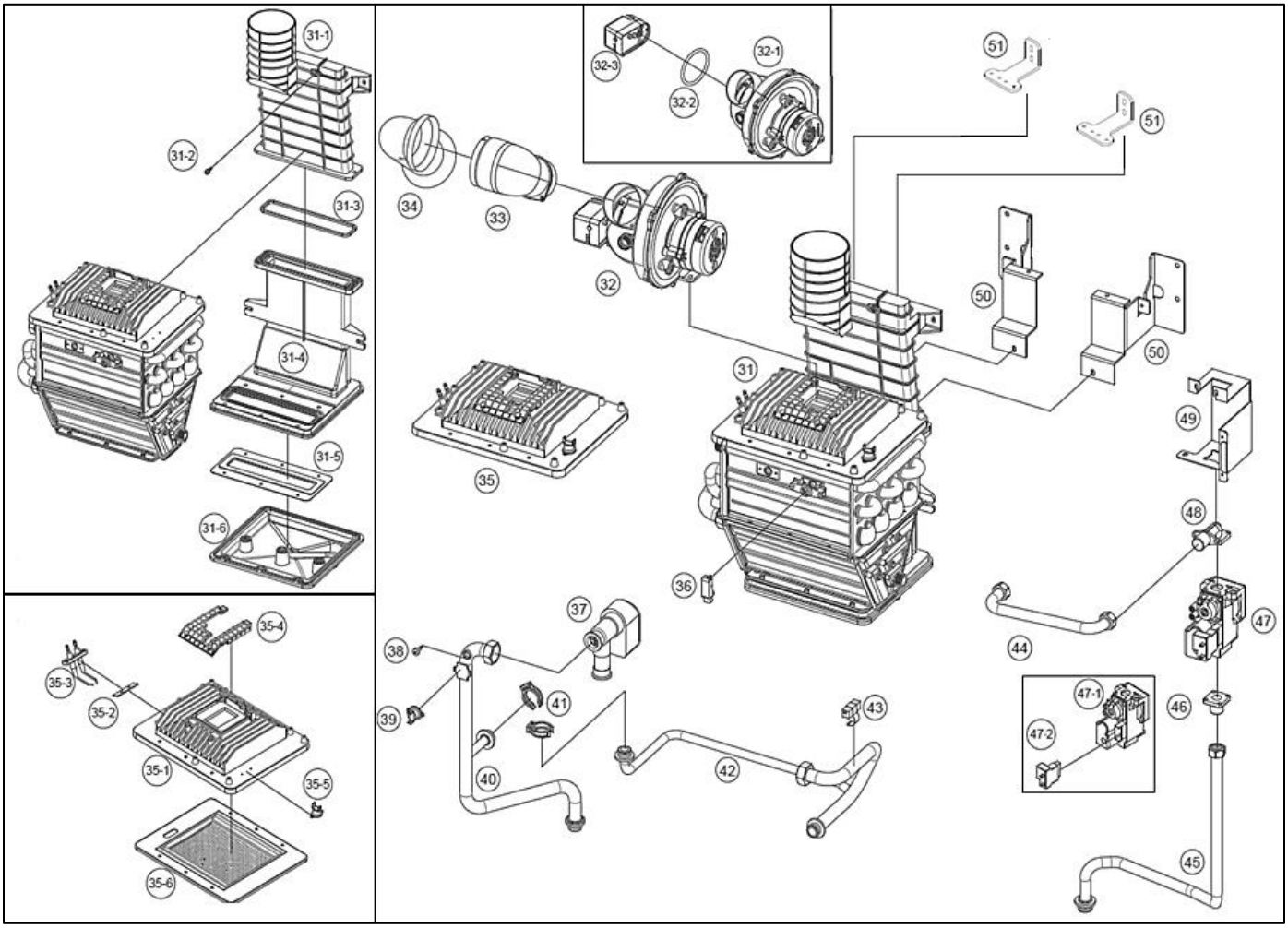


Figure 39 – Heat Exchanger Replacement Parts

NUMBER	DESCRIPTION	PART NUMBER	NUMBER	DESCRIPTION	PART NUMBER
31	HEAT EXCHANGER ASSY	7850P-032	35-6	METAL FIBER	7850P-075
31-1	EXHAUST PIPE ASSY (UP)	7850P-033	36	FLAME DETECTOR SENSOR	7850P-031
31-2	EXHAUST TEMPERATURE SENSOR	7850P-070	37	MIXING VALVE	7850P-054
31-3	EXHAUST GASKET 1	7850P-071	38	WATER TEMPERATURE SENSOR	7850P-081
31-4	EXHAUST PIPE ASSY (DOWN)	7850P-034	39	WATER TEMPERATURE OVERHEAT SENSOR	7850P-051
31-5	EXHAUST GASKET 2	7850P-072	40	DHW OUTLET PIPE	7850P-049
31-6	CONDENSATE GUTTER	7850P-073	41	WATER PIPING CLIP	7850P-055
32	FAN ASSEMBLY	7850P-006	42	DHW INLET PIPE	7850P-048
32-1	FAN	7850P-002	43	CERAMIC HEATER	7850P-076
32-2	O-RING	7850P-003	44	GAS VALVE PIPE	7850P-039
32-3	AGM (ACTUATOR)	7850P-004	45	GAS VALVE PIPE	7850P-040
33	SILENCER ELBOW	7850P-036	46	GAS VALVE ADAPTER (STRAIGHT)	7850P-077
34	SILENCER BODY	7850P-035	47	GAS VALVE ASSY W/ PLUG	7850P-078
35	BURNER ASSY	7850P-011	47-1	GAS VALVE	7850P-012
35-1	BURNER HEAD	7850P-007	47-2	GAS VALVE PLUG	7850P-013
35-2	IGNITION ROD BRACKET	7850P-010	48	GAS VALVE ADAPTER (90 DEGREE)	7850P-079
35-3	IGNITION ROD	7850P-008	49	GAS VALVE BRACKET	7850P-080
35-4	BLOWER HEAD BRACKET	7850P-074	50	BOTTOM HEAT EXCHANGER BRACKETS	7850P-028
35-5	OVERHEAT SENSOR (BURNER)	7850P-009	51	TOP HEAT EXCHANGER BRACKETS	7850P-082

Table 27 – Heat Exchanger Replacement Parts

Limited Warranty for Residential Tankless Water Heaters

Westinghouse warrants each instantaneous water heater and its parts to be free from defects in materials and workmanship according to the following terms, conditions, and time periods. The replacement water heater will be warranted for the unexpired portion of the applicable warranty period of the original water heater. The number of replacement water heaters is limited to one (1) per original water heater purchased. Replacement parts will be warranted for 90 days. **UNLESS OTHERWISE NOTED THESE WARRANTIES COMMENCE ON THE DATE OF INSTALLATION.** This limited warranty is only available to the **original owner** of this water heater, and is non-transferable.

Residential Use Warranty	Commercial Use Warranty
Twelve (12) years – Heat Exchanger, Five (5) years – Parts	**Five (5) years – Heat Exchanger, One (1) Year – Parts**
USE DEFINTIONS - Residential Use means potable water heating in a single family residence. Commercial Use refers to all other applications, including any space heating applications.	

COVERAGE

A. Should a defect or malfunction result in a leakage of water within the above-stated warranty periods due to defective material or workmanship, malfunction, or failure to comply with the above warranty, Westinghouse will replace the defective or malfunctioning water heater or part(s) with a replacement of the nearest comparable model available at the time of replacement.
B. If Westinghouse is unable to repair or replace the water heater or part(s) so as to conform to this warranty after a reasonable number of attempts, Westinghouse will then provide, at its option, a replacement water heater. These remedies are the purchaser's exclusive remedies for breach of warranty.
C. If government regulations, industry certification, or similar standards require the replacement water heater or part(s) to have features not found in the defective water heater or part(s), the owner will be charged the difference in price represented by those required features. If the owner pays the price difference for those required features and/or to upgrade the size and/or other features available on a new replacement water heater or part(s), the owner will also receive a complete new limited warranty for that replacement water heater or part(s).
D. If at the time of a request for service the owner cannot provide a copy of the original sales receipt or the warranty registration, the warranty period for the water heater shall then be deemed to have commenced thirty (30) days after the date of manufacture of the water heater and **NOT** the date of installation of the water heater.
E. This warranty extends only to water heaters utilized in heating applications that have been properly installed by qualified professionals based upon the manufacturer's installation instructions.

OWNER RESPONSIBILITIES

To avoid the exclusion list in this warranty, the owner or installer must:
1. Maintain the water heater in accordance with the maintenance procedure listed in the manufacturer's provided instructions. Preventive maintenance can help avoid any unnecessary breakdown of your water heater and keep it running at optimum efficiency.
2. Maintain all related system components in good operating condition.
3. If the cold water supply line has a backflow preventer, then an expansion tank should be installed to allow for water expansion.
4. Use the water heater at water pressures not exceeding the working pressure shown on the rating plate.

WARRANTY EXCLUSIONS

This limited warranty will not cover:
1. Any water heater purchased from an unauthorized dealer or online retailer.
2. Any water heater not installed by a qualified heating installer/service technician, or installations that do not conform to ANSI, CSA, and/or ETL standards, as well as any applicable national or local building codes.
3. Service trips to teach you how to install, use, maintain, or to bring the water heater installation into compliance with local building codes and regulations.
4. Failure to locate the water heater in an area where leakage of the tank or water line connections and the combination temperature and relief valve will not result in damage to the area adjacent to the water heater or lower floors of the structure.
5. Any failed components of the heat system not manufactured by Westinghouse as part of the water heater.
6. Water heaters repaired or altered without the prior written approval of Westinghouse.
7. Damages, malfunctions, or failures resulting from failure to install the water heater in accordance with applicable building codes/ordinances or good plumbing and electrical trade practices.
8. Damages, malfunctions, or failures resulting from improper installation, failure to operate the water heater at pressures not exceeding the working pressure shown on the rating plate, or failure to operate and maintain the water heater in accordance with the manufacturer's provided instructions.
9. Failure to operate the water heater in an open system with a properly sized and installed thermal expansion tank.
10. Failure or performance problems caused by improper sizing of the water heater, expansion device, piping, or the gas supply line, the venting connection, combustion air openings, electric service voltage, wiring or fusing.
11. Damages, malfunctions, or failures caused by improper conversion from natural gas to LP gas or LP gas to natural gas.
12. Damages, malfunctions, or failures caused by operating the water heater with modified, altered, or unapproved parts.
13. Damages, malfunctions, or failures caused by abuse, accident, fire, flood, freeze, lightning, acts of God and the like.
14. Tank failures (leaks) caused by operating the water heater in a corrosive or contaminated atmosphere.
15. Damages, malfunctions, or failures caused by operating the water heater with an empty or partially empty tank ("dry firing"), or failures caused by operating the water heater when it is not supplied with potable water, free to circulate at all times.

16. Failure of the heater due to the accumulation of solid materials and lime deposits.
17. Any damage or failure resulting from improper water chemistry, or heating anything other than potable water. DEFINITION OF POTABLE WATER - Potable water is defined as drinkable water supplied from utility or well water in compliance with EPA secondary maximum contaminant levels (40 CFR Part 143.3) as shown in the table. Westinghouse will warrant the heat exchanger coil for hardness up to 12 Grains per gallon.
18. Components of the water heater that are not defective, but must be replaced during the warranty period as a result of reasonable wear and tear.
19. Damages, malfunctions, or failures caused by subjecting the water heater to pressures or firing rates greater than those shown on the rating label.
20. Damages, malfunctions, or failures resulting from the use of any attachment(s) not supplied by Westinghouse.
21. Water heaters moved from the original installation location.
22. Water heaters that have had their rating labels removed.

EPA DEFINITION OF POTABLE WATER	
Contaminant	**Level**
Aluminum	0.05 to 0.2 mg/l
Chloride	250 mg/l
Color	15 color units
Copper	1.0 mg/l
Corrosivity	Non-corrosive
Fluoride	2.0 mg/l
Foaming Agents	0.5 mg/l
Iron	0.3 mg/l
Manganese	0.05 mg/l
Odor	3 threshold odor number
pH	6.5 – 8.5
Silver	0.1 mg/l
Sulfate	250 mg/l
Total Dissolved Solids (TDS)	500 mg/l
Zinc	5 mg/l

PROCEDURES FOR WARRANTY SERVICE REQUESTS

Any claim for warranty assistance must be made promptly. Determine if the water heater is “in-warranty” (that is, within the applicable warranty period) by reviewing a copy of the original sales receipt or warranty registration. The owner must present a copy of the original sales receipt or warranty registration for a warranty service request.
If the water heater is “in-warranty”, contact the distributor from whom the water heater was purchased (or the installer) for assistance. Be prepared to provide the retailer or installer with a copy of the original receipt, complete model and serial numbers, and the date of installation of the water heater, in addition to explanation of the water heater problem.
Warranty coverage is subject to validation of “in-warranty” coverage by Westinghouse claims department personnel. All alleged defective or malfunctioning parts must be returned to Westinghouse via the **local distribution channels** where original purchase was made. **NOTE: Any parts or heaters returned to Westinghouse for warranty analysis will become the property of Westinghouse and will not be returned, even if credit is denied.** If all warranty conditions are satisfied, Westinghouse will provide replacement parts to the retailer.
For questions about the coverage of this warranty, please contact Westinghouse at the phone number stated below:

1-774-417-6000

SERVICE, LABOR AND SHIPPING COSTS

This limited warranty does not extend to any shipping charges, delivery expenses, or administrative fees incurred by the owner in repairing or replacing the water heater or part(s). This warranty does not extend to labor costs beyond the coverage specified in this warranty document. All such expenses are the owner’s responsibility.

LIMITATIONS OF YOUR WESTINGHOUSE WARRANTY AND REMEDIES

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND ARE GIVEN AND ACCEPTED IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ANY OBLIGATION, LIABILITY, RIGHT, CLAIM OR REMEDY IN CONTRACT OR TORT, WHETHER OR NOT ARISING FROM WESTINGHOUSE’S NEGLIGENCE, ACTUAL OR IMPUTED. THE REMEDIES OF THE PURCHASER SHALL BE LIMITED TO THOSE PROVIDED HEREIN TO THE EXCLUSION OF ANY OTHER REMEDIES INCLUDING WITHOUT LIMITATION, INCIDENTAL OR CONSE-QUENTIAL DAMAGES, SAID INCIDENTAL AND CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, PROPERTY DAMAGE, LOST PROFIT OR DAMAGES ALLEGED TO HAVE BEEN CAUSED BY ANY FAILURE OF WESTINGHOUSE TO MEET ANY OBLIGATION UNDER THIS AGREEMENT INCLUDING THE OBLIGATION TO REPAIR AND REPLACE SET FORTH ABOVE. NO AGREEMENT VARYING OR EXTENDING THE FOREGOING WARRANTIES, REMEDIES OR THIS LIMITATION WILL BE BINDING UPON WESTINGHOUSE. UNLESS IN WRITING AND SIGNED BY A DULY AUTHORIZED OFFICER OF WESTINGHOUSE. THE WARRANTIES STATED HEREIN ARE NOT TRANSFERABLE AND SHALL BE FOR THE BENEFIT OF THE ORIGINAL PURCHASER ONLY.

NO OTHER WARRANTIES

This Westinghouse Warranty gives you specific legal rights, and you may also have other rights that vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages so this limitation or exclusion may not apply to you.
These are the only written warranties applicable to the commercial water heater manufactured and sold by Westinghouse. Westinghouse neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with said commercial water heaters. Westinghouse reserves the right to change specifications or discontinue models without notice.

MAINTENANCE REPORT

CAUTION

In unusually dirty or dusty conditions, care must be taken to keep water heater cabinet door in place at all times. Failure to do so VOIDS WARRANTY!

⚠ WARNING

Allowing the water heater to operate with a dirty combustion chamber will hurt operation. Failure to clean the heat exchanger as needed by the installation location could result in water heater failure, property damage, personal injury, or death. Such product failures ARE NOT covered under warranty.

The water heater requires minimal periodic maintenance under normal conditions. However, in unusually dirty or dusty conditions, periodic vacuuming of the cover to maintain visibility of the display and indicators is recommended.

Periodic maintenance should be performed once a year by a qualified service technician to assure that all the equipment is operating safely and efficiently. The owner should make necessary arrangements with a qualified heating contractor for periodic maintenance of the water heater. Installer must also inform the owner that the lack of proper care and maintenance of the water heater may result in a hazardous condition.

INSPECTION ACTIVITIES		DATE LAST COMPLETED			
PIPING		1st YEAR	2nd YEAR	3rd YEAR	4th YEAR*
Near water heater piping	Check water heater and system piping for any sign of leakage. Leaking pipes could cause property damage. Make sure all piping is properly supported. Flush tankless heat exchanger annually (more in hard water conditions). See User's Information manual for instructions.				
Vent	Check condition of all vent pipes and joints. Ensure all vent piping is properly supported. Check for obstructions exhaust and intake termination points.				
Gas	Check Gas piping, test for leaks and signs of aging. Make sure all pipes are properly supported.				
SYSTEM					
Visual	Do a full visual inspection of all system components.				
Functional	Test all functions of the system (Heat, Safeties)				
Temperatures	Verify safe settings on water heater or Anti-Scald Valve				
Temperatures	Verify programmed temperature settings				
ELECTRICAL					
Connections	Check wire connections. Make sure they are tight.				
Smoke and CO detector	Verify devices are installed and working properly. Change batteries if necessary.				
Circuit Breakers	Check to see that the circuit breaker is clearly labeled. Exercise circuit breaker.				
Switch and Plug	Verify ON/OFF switch and convenience plug are both functional				
CHAMBER/BURNER					
Combustion Chamber	Check burner tube and combustion chamber coils. Clean according to maintenance section of manual. Vacuum combustion chamber.				
Spark Electrode	Clean. Set gap at 1/8".				
CONDENSATE					
Condensate Trap	Clean debris from the condensate trap. Fill with clean water.				
Neutralizer	Check condensate neutralizer. Replace if necessary.				
Condensate hose	Disconnect condensate hose. Clean out dirt and re-install. (NOTE: Verify the flow of condensate, making sure that the hose is properly connected during final inspection.)				
GAS					
Pressure	Measure incoming gas pressure (3.5" to 14" W.C.)				
Pressure Drop	Measure drop in pressure on light off (no more than 1" W.C.)				
Check gas pipe for leaks	Check piping for leaks. Verify that all are properly supported.				
COMBUSTION					
CO/CO2 Levels	Check CO and CO2 levels in Exhaust. Record at high and low fire.				
SAFETIES					
ECO (Energy Cut Out)	Check continuity on Flue and Water ECO. Replace if corroded.				

FINAL INSPECTION					
Check list	Verify that you have completed entire check list. WARNING: FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.				
Homeowner	Review what you have done with the homeowner.				
TECH SIGN OFF					

Table 28 - *Continue annual maintenance beyond the 4th year as required.

ADDITIONAL INSTALLATION REQUIREMENTS FOR THE COMMONWEALTH OF MASSACHUSETTS

In the Commonwealth of Massachusetts, the installer or service agent shall be a plumber or gas fitter licensed by the Commonwealth.

When installed in the Commonwealth of Massachusetts or where applicable state codes may apply; the unit shall be installed with a CO detector per the requirements listed below.

5.08: Modifications to NFPA-54, Chapter 10

(1) Revise NFPA-54 section 10.5.4.2 by adding a second exception as follows:

Existing chimneys shall be permitted to have their use continued when a gas conversion burner is installed, and shall be equipped with a manually reset device that will automatically shut off the gas to the burner in the event of a sustained back-draft.

(2) Revise 10.8.3 by adding the following additional requirements:

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the service of qualified licensed professionals for the installation of hard wired carbon monoxide detectors

a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.

b. In the event that the requirements of this subdivision cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW, KEEP CLEAR OF ALL OBSTRUCTIONS".

4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08 (2)(a) 1 through 4.

(b) EXEMPTIONS: the following equipment is exempt from 248 CMR 5.08 (2)(a) 1 through 4:

1. The equipment listed in Chapter 10 entitled "Equipment Not Required to be Vented" in the most current edition of NFPA 54 as adopted by the Board; and

2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM PROVIDED. When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1. Detailed instructions for the installation of the venting system design or the venting system components; and

2. A complete parts list for the venting system design or venting system.

(d) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED. When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:

1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and

2. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

(e) A copy of all installation instructions for all Product Approval side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

MAINTENANCE NOTES

CUSTOMER INSTALLATION RECORD FORM

The following form should be completed by the installer for you to keep as a record of the installation in case of a warranty claim. After reading the important notes at the bottom of the page, please also sign this document.

Customer's Name:	
Installation Address:	
Date of Installation:	
Installer's Code/Name:	
Product Serial Number(s):	
Combustion Setting at Time of Installation:	
Comments:	
Installer's Phone Number:	
Signed by Installer:	
Signed by Customer:	

IMPORTANT NOTES:

Customer: Please only sign after the installer has reviewed the installation, safety, proper operation and maintenance of the system. In the case that the system has any problems, please call the installer. If you are unable to make contact, please contact your Westinghouse Sales Representative.

Distributor/Dealer: Please insert contact details.

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